

SPECIAL ISSUE

**PC
MAGAZINE**

SEPTEMBER 25, 1990

THE INDEPENDENT GUIDE TO IBM-STANDARD P

FIRST LOOKS

**NetWare and LAN
Manager Upgrades:
A New Pecking
Order?**

FIRST LOOKS

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MAINTENANCE

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AFTER HOURS

**Better than the Book:
3 Encyclopedias on
CD-ROM Deliver
Multimedia Today**

VOLUME 9 NUMBER 16

First Ever!
**SERVICE
RELIABILITY
SURVEY**

**We Rate the Industry on Reliability,
Tech Support, Repair Service,
and Customer Loyalty**

- ☒ 27 Computer Vendors
- ☒ 22 Monitor Makers
- ☒ 17 Printer Companies
- ☒ 12 Hard Disk Manufacturers
- ☒ 12 Laptop Vendors
- ☒ 11 Graphics Board Makers

Dear Reader:
We know how much you want to improve your computer equipment. Please write in the space provided.
Please add any comments about the computer equipment you mentioned in this survey. Please write in the space provided.

My experiences with this computer have ranged from extreme satisfaction to frustration. I wish I had seen more with the manufacturer before I

- Classification**
The following questions are for classification purposes only. They are not intended to be personally responsible to you or your organization.
- Are you personally responsible for the equipment?
1 Yes, on a formal basis as part of my job
2 Yes, on an informal basis
3 No
 - Have you ever personally opened up the equipment?
1 Yes
2 No
 - Which, if any, of the following internal components have you replaced?
1 Memory
2 Hard disk
3 Other
 - What is your level of education?
1 Under high school
2 High school graduate
3 College graduate
4 Graduate work but did not (yet) receive a degree (MA, PhD, MD, etc.)
5 Some postgraduate work
- Thank you for your help! Now, please e-mail: Speak back to PC Magazine

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processing will
evolve more
in the next three
pages than it
has in the last
ten years.

Market Survey and Ten-Year Growth Plan

EXECUTIVE SUMMARY

BLUE YONDER AIRWAYS



Introduction

As Blue Yonder Airways moves from freight to passenger service, the Sales and Marketing Division is presented with a multitude of new challenges and opportunities. This report consists of a marketing proposal for the next ten years -- a virtual blueprint for growth in our critical first decade as a passenger carrier. Our

resulting from a series of focus groups conducted by the market research firm Crump & Graham. The growth plan includes specific suggestions for ways to leverage our track record in the freight arena to build out our share of single-passenger bookings, and ultimately expand into general sales. A detailed analysis of costs and

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Speed	33-MHz	33-MHz	25-MHz	25-MHz
Memory	1-MB	2-MB	2-MB	2-MB
Cache	64-KB	64-KB	Opt.	Opt.
Video	Opt.	SVGA*	Opt.	SVGA*
Monitor	Opt.	SVGA*	Opt.	SVGA*
Storage	0-MB	40-MB	0-MB	106-MB
Floppies	5.25	3.5", 5.25*	5.25*	3.5", 5.25*
Price	\$3,499	\$4,999	\$4,999	\$7,199

*Graphics adapter supports both standard VGA resolutions and 800x600 SuperVGA (SVGA) modes. Monitor automatically adjusts frequency to support both standard VGA and SVGA modes.

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Just Upgrade the CPU™

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If you want a system that can evolve to meet your future needs at a price that's nothing short of revolutionary, the ALR BusinessVEISA 386/33 was built for you. For more information, please call:

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The ALR BusinessVEISA				
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Floppies	5.25	3.5", 5.25"	5.25"	3.5", 5.25"
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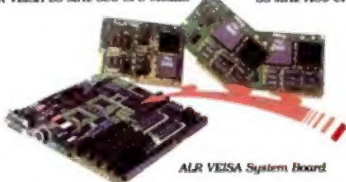
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ALR VEISA 33-MHz 386 CPU Module

33-MHz 486 CPU Module



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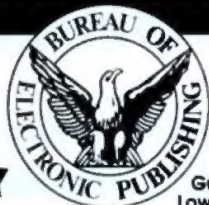
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CIRCLE 180 ON READER SERVICE CARD

Inside

It's our job to know what you're thinking. We've always been good listeners, but in 1985 we upped the ante by introducing *PC Magazine's* Interactive Readers' Service, and followed that success in 1988 with PC MagNet. Then, in our March 27, 1990, issue, we inserted a questionnaire that gave our 750,000-plus readers a shot at telling us exactly what they think about the reliability of their computers and peripherals. The resultant data brings out some rather compelling news about the PC industry from its most experienced and knowledgeable source: you.

The process began with a key insight: that the expense of service and support can represent a huge portion of a PC's cost. To gauge how well the industry is helping you to minimize that cost, Ziff-Davis Publishing Co.'s research department met with *PC Magazine's* editor-in-chief Bill Machrone and group research director Neil Karlin to devise the *PC Magazine* Equipment Satisfaction Poll.

The nearly 20,000 responses returned to us yielded more than a million individual pieces of data that had to be codified and tabulated. Says Karlin, a veteran of many Ziff-Davis research projects, "One of the most daunting challenges we faced was the need for discrete codes to identify each product listed in each respondent's survey."



Those codes were then compiled into a comprehensive code book that lists almost 6,000 individual makes and model names. "This was," says Karlin, "a massive task. Every code on the list had to be checked and rechecked for accuracy."

Karlin then turned the reins over to group research director Elda Vale. Vale was called upon to direct the research staff and to act as a liaison with *PC Magazine's* editorial features department.

She handled the delicate task of helping the editorial staff prepare the information in some 40 books of tables for publication. Vale, who started her work in research as a poll analyst for CBS, tells us that "no survey of this magnitude and with such a complex methodology has ever been



Ziff-Davis group research directors Elda Vale and Neil Karlin headed up the *PC Magazine* Equipment Satisfaction Poll's design team.

undertaken in our department before, and I was happy with how much we accomplished in a very tight timeframe."

Some of you will find controversy in what you are about to read; others will find confirmation. And some of you will find your own words, taken directly from the surveys you sent us.

We believe that all of you will find this undertaking indispensable and in keeping with *PC Magazine's* vital mission: to give you the best comparative information on the PC industry—and to give you every opportunity to let us know exactly what you're thinking.—Tom Unger ■

PC Magazine: The Independent Guide to IBM Standard Personal Computing. ISSN #0898-8507, is published biweekly except in July and August for \$44.97 for one year. Ziff-Davis Publishing Co., a division of Ziff Communications Co., One Park Ave. New York, NY 10016. Second-class postage paid at New York, NY 10016 and at additional mailing offices. POSTMASTER: Address changes to PC Magazine P.O. Box 54093, Boulder, CO 80321-4093.

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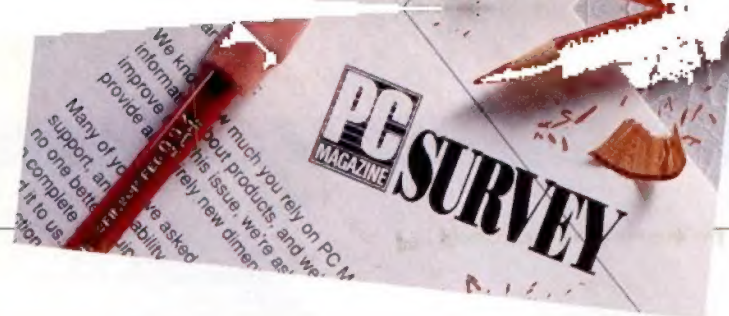
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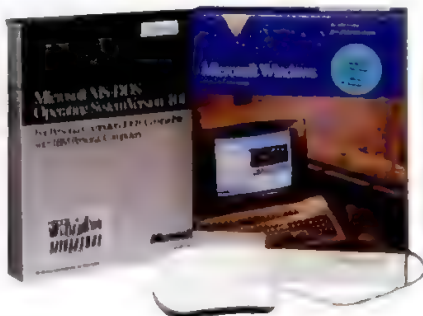
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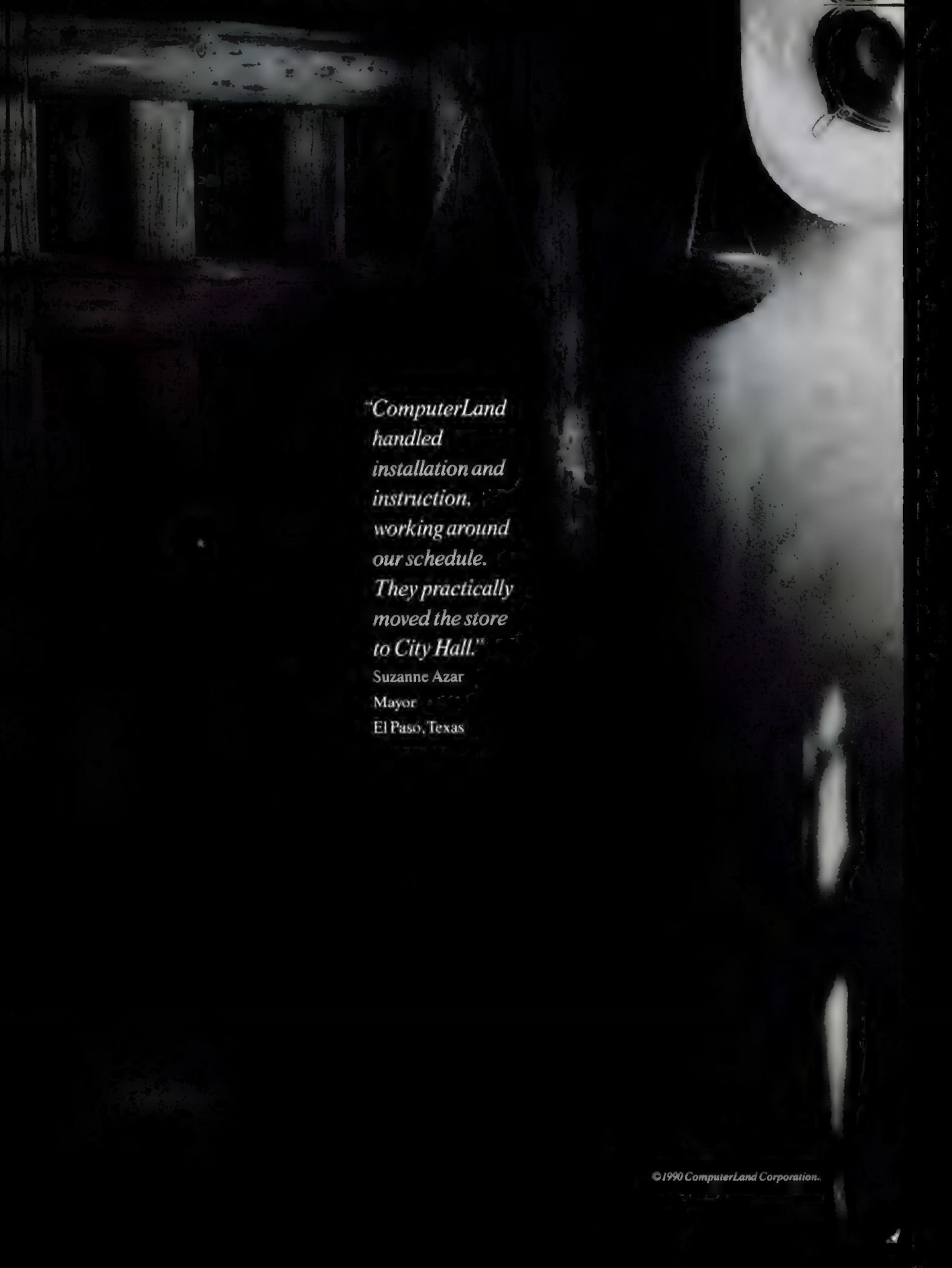
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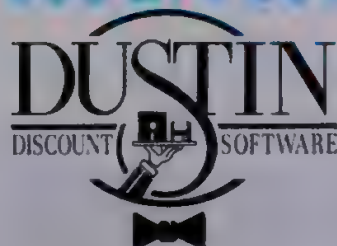
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Letters

BUS WARS: EISA STRIKES BACK

Your bus comparison article, "The Bus Wars: ISA's Surprising Staying Power" (June 26, 1990), was a disservice to the public, your advertisers, and your publication. The article encourages members of the public who depend on high-performance computers to invest money in equipment that is semiobsolete.

This is how I see it: you can buy an ISA computer today for \$5,000 and buy an EISA (or MCA) computer tomorrow for \$5,000 for a total of \$10,000. Or you can buy an EISA computer today for \$7,000 (ALR and Dell) and take full advantage of today's technology as well as tomorrow's bigger GUIs, multitasking, and the coming desktop multimedia. Total: \$7,000.

David Cruz

Collegedale, Tennessee

I enjoyed your article on bus wars very much but must take issue with the closing statement. Winn Rosch claims that you won't see much of a performance difference using a bus-mastering board while running DOS. Bull!

For the past month I've had a Western Digital 7000FASST2 SCSI host adapter in my 10-MHz AT clone, and I couldn't be happier. I started with an 8-bit SCSI host adapter with my interleave set to 6:1 so that I could stay error free. This gave me a transfer rate of about 125 kilobits per second. Since I installed the Bus Mastering 7000 controller, I've been able to reset my interleave to 1:1 and now have a transfer rate of 500 kbps with *no* errors.

F. Robert Falbo

Rome, New York



The performance improvement you saw is derived *not* from bus mastering—which the Western Digital controller does not support—but by the SCSI host adapter's adroit abilities in converting DOS requests into SCSI commands. With DOS such hardware upgrades will yield greater performance than switching buses.—Winn L. Rosch



Our article on bus wars triggered lots of responses from our readers, most of them angry.

MORE DEBATE: LANS AND MINIS

In "Can LANs Beat Minis?" (May 29, 1990) you "decided to forgo all the usual measures of system performance such as MIPS." Well, selecting the mVAX 3100 certainly did ignore MIPS.

To do a fair comparison of minis to micros, a hot RISC machine like the Hewlett-Packard 9000 or Data General Avion would have been a more appropriate choice. There is little to be learned by comparing results from a Compaq Systempro introduced in 1990 to a minicomputer that's been around for years.

With the mVAX 3100 creating its own transactions, the additional load would invariably skew the results in favor of a multisystem LAN configuration. You haven't provided an unbiased Rosetta stone to decipher which platform is the right choice.

Roger D. Hoff

El Segundo, California

While your comparison of LAN and mini relative performance was fair, there may have been an error in your projections for larger numbers of users. A five-user network driven by PCs generating transac-

tions automatically every 5 seconds places the same burden on a system as 50 human users entering transactions every 50 seconds. However, the human users would be running ten times as many parallel tasks and would therefore place a heavier burden on the central CPU for task management and virtual storage. Each task would need an allocation of RAM for I/O buffers and working storage.

Much of the complexity in minicomputer and mainframe operating systems is associated with optimizing their performance when running hundreds of on-line tasks. There is a widely available body of literature that can be used to predict the relative performance of a Microvax 3100 versus the 3900 or the 6000 with varying numbers of users. There is no similar body of knowledge available for projecting LAN performance with CPU or database-intensive applications on a centralized server with 100 users.

Michael A. Sicilian

New York, New York



We certainly agree that many factors come into play when you try to compare the value of minicomputers versus a distributed network of PCs. The rapid progress in client-server applications and server CPU power keeps PC LAN Labs constantly creating meaningful LAN performance models. Servers that loaf today will be purring busily when asked to run the new emerging communications, management, and database tasks. Network designers will be able to create a sliding scale of workstation versus server workload.—Frank J. Derfler, Jr.



WINDOWS IS HERE TO STAY

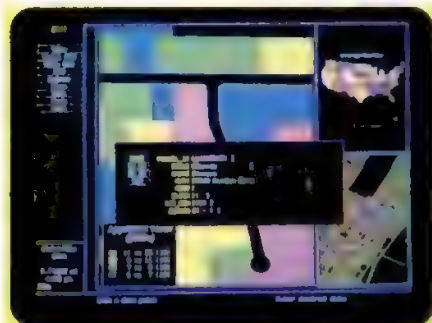
I'm becoming a bit concerned with your emerging editorial focus (and implicit endorsement) of *Microsoft Windows*. The new *Windows* column aside, the program is still shy of people's expectations. Promises made have yet to be kept.

Why focus so much on *Windows* as the environment of choice? Makes me won-

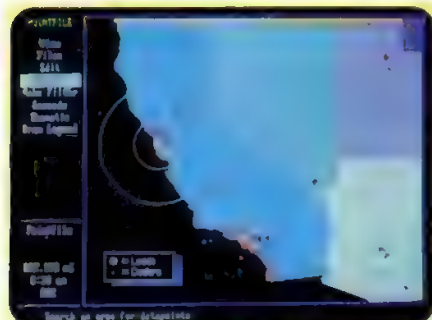
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Letters

der how much of Microsoft's questionable success comes from you.

Mike Neeman
Dayton, Ohio



Windows 3.0 is the most compelling reason we know to buy new hardware and software.—Ed.

SIMPLIFIED SOFTWARE

Jim Seymour's column (June 12, 1990) on software that leaves our needs behind was right on the money.

Releasing simplified versions of programs, as Mr. Seymour suggests, is one possible solution, if they include a reasonable upgrade policy.

Let me pay for, add in, and learn the features I need as I need them, without reinstalling what I already have.

Jim Robbins
Portland, Michigan

SOFTWARE SLOP

John Dvorak is great. I really loved his article on software slop (June 12, 1990).

Unfortunately, the slop doesn't stop with software; most of it is in the manuals. I just purchased a new printer. I'm sure it's an excellent unit, but there are all sorts of features I'll never be able to use because the manual is slop.

One of the premarketing requirements should be that manuals must be given a trial with some person in the company other than the developers. But then, would management really want to know the truth about their products? I doubt it.

Bob Allen
Springfield, Massachusetts

UNMENTIONED UTILITIES

I was surprised and disappointed when your own DIRMAGIC was not included in the "all-star utility lineup" by Edward Mendelson (June 26, 1990). What other utility allows you to remove a whole directory with two keystrokes? My wife is afraid of PC Tools but uses DIRMAGIC like a pro. When I recently upgraded to DOS 4.x and DIRMAGIC would not work on her machine, I had to switch to DOS 3.3 and repartition her hard disk. Please upgrade DIRMAGIC to support DOS 4.x so that I can get rid of hard disk partitions.

Hinton S. Amerson
Dahlonega, Georgia



DIRMAGIC has been upgraded to work with DOS 4.x (and Compaq's DOS 3.x/4.x.) The upgrade is only needed if the user has a disk partition that is greater than 32MB. It can be downloaded from PC MagNet, or you can send a self-addressed, stamped disk mailer and disk or \$15 to: Michael J. Mefford, P.O. Box 351, Gleneden Beach, OR 97388.—Ed.

I enjoyed your article, "The Ultimate Utility Shelf," (June 26, 1990). I was especially pleased that you have recognized the need for computer virus software and picked two of John McAfee's programs. However, your editors still seem to believe that "the chance that you'll be attacked by a virus is so small, it's not worth the memory overhead of keeping a TSR virus-watcher loaded and active in the background."

That statement is not true in 1990. The number of virus attacks on PCs have escalated sharply in the past two years. In December of 1989, there were some 50 to 60 known computer viruses; now there are over 80.

Unlike the PC Magazine editorial staff, I find that computer viruses share a number of similarities with HIV infections, including:

- (1) No one really knows who is infected or the infection rate.
- (2) No one thinks he or she will become infected.
- (3) The signs and symptoms of infection are diverse and many times thought to be caused by something else.
- (4) The manifestations of infection may take a long time to appear but cause harm during that time period.
- (5) The "experts" tell you not to worry, there is no problem.
- (6) Transmission is simple and silent.

Your editor missed McAfee's newest and best software virus program, FSHIELD.EXE. FSHIELD can be added to .EXE and .COM files and will prevent viral string entrance into these programs—probably the first software "immunization" against PC viruses.

John R. De Palma, M.D.
Santa Monica, California

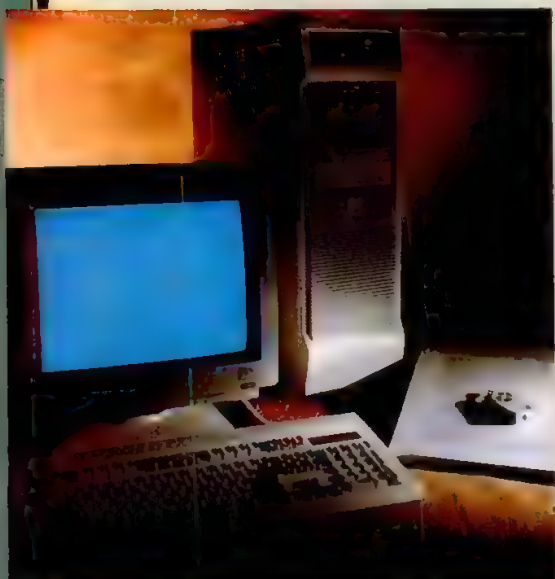


You're right: we left out FSHIELD. You can try it first as shareware from McAfee Associates, 4423 Cheeney, Santa Clara, CA 95054; (408) 988-3832 or download the program directly from their 24-hour a day BBS: (408) 988-4004, 1,200 baud or 2,400

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Letters

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THWARTING BOOTLEGGERS

Copy protection is indeed stupid (John C. Dvorak's column, May 15, 1990). Software companies complain that they lose billions of dollars a year to bootleggers. Baloney!! The legitimate users pay billions of dollars a year too much to subsidize bootleggers. If the leading word processing, spreadsheet, and database packages were lowered from \$600 to \$399, the number of bootleggers would dramatically decrease and the number of legitimate users would dramatically increase.

R. Zen Miller
Tempe, Arizona

LIFETIME WARRANTIES?

While formatting some disks last night and getting some bad sectors marked by DOS, I began to wonder about the real worth of the lifetime warranties that most reputable disk manufacturers display on their boxes.

The cost of disks is so low now that any manufacturer will surely without question replace any disk that a user claims is bad. But how many users make claims on disk manufacturers? Has anybody pursued a manufacturer in a claim for bad disks?

Jeremy B. Clark
Kingston, Jamaica

CD-ROM VS. BOOKS

Let's hoist a few to John C. Dvorak. A few months ago, I experienced the exact same mentality that Mr. Dvorak described in his May 29, 1990, Inside Track column. An Encyclopedia Britannica salesman paid me a visit to try to peddle his wares.

Now, don't get me wrong, I would love to have a copy of the Britannica around the house, but where would I put it? Under the Microsoft C binders? Behind the AutoCAD manuals?

Upon asking if perhaps the encyclopedia was yet available on CD-ROM or even conventional disk media, I was given a stare that would have made the Inquisitors of Spain proud. I was informed that the Encyclopedia Britannica was too great an achievement to be relegated to something as mundane as a computer. This would only detract from its beauty. He said computers would *never* replace books.

Ha and double ha. Next time you're in New Hampshire, Mr. Dvorak, the beers are on me.

Mark A. Scott
Nashua, New Hampshire

The Inside Track column made incorrect assertions concerning our award-winning *Compton's MultiMedia Encyclopedia* (CMME), the new CD-ROM reference published recently by Britannica Software.

John C. Dvorak said Britannica "bought *Compton's MultiMedia Encyclopedia* and put it on a CD-ROM." Readers should be aware that Encyclopaedia Britannica acquired the Compton's Learning Co. in 1961. We completed a massive revision of the company last year, and that print work is the basis for the new CD-ROM product. CMME combines text, audio, outstanding graphics, and animation on a five-inch disk. The print product and the electronic edition have received favorable reviews by the American Library Association.

We take exception to your depiction of encyclopedia purchasers. You claim that people who buy encyclopedias never read them and that only CD-ROM products are "useful." Statistics show that we have many careful, loyal readers. So while we have an exceptional CD-ROM product, we will also continue to publish high-quality reference material in print as well as electronic forms.

Stanley D. Frank
Executive Vice President
Encyclopaedia Britannica
Chicago, Illinois

CORRECTIONS&LIFICATIONS

We received a few letters requesting the address and phone number for Power Up Software, mentioned in Jim Seymour's column in the June 26, 1990, issue. Here it is: Power Up Software Corp., P.O. Box 7600, San Mateo, CA 94403; (800) 851-2917, (800) 223-1479 in Calif., (415) 345-5900.

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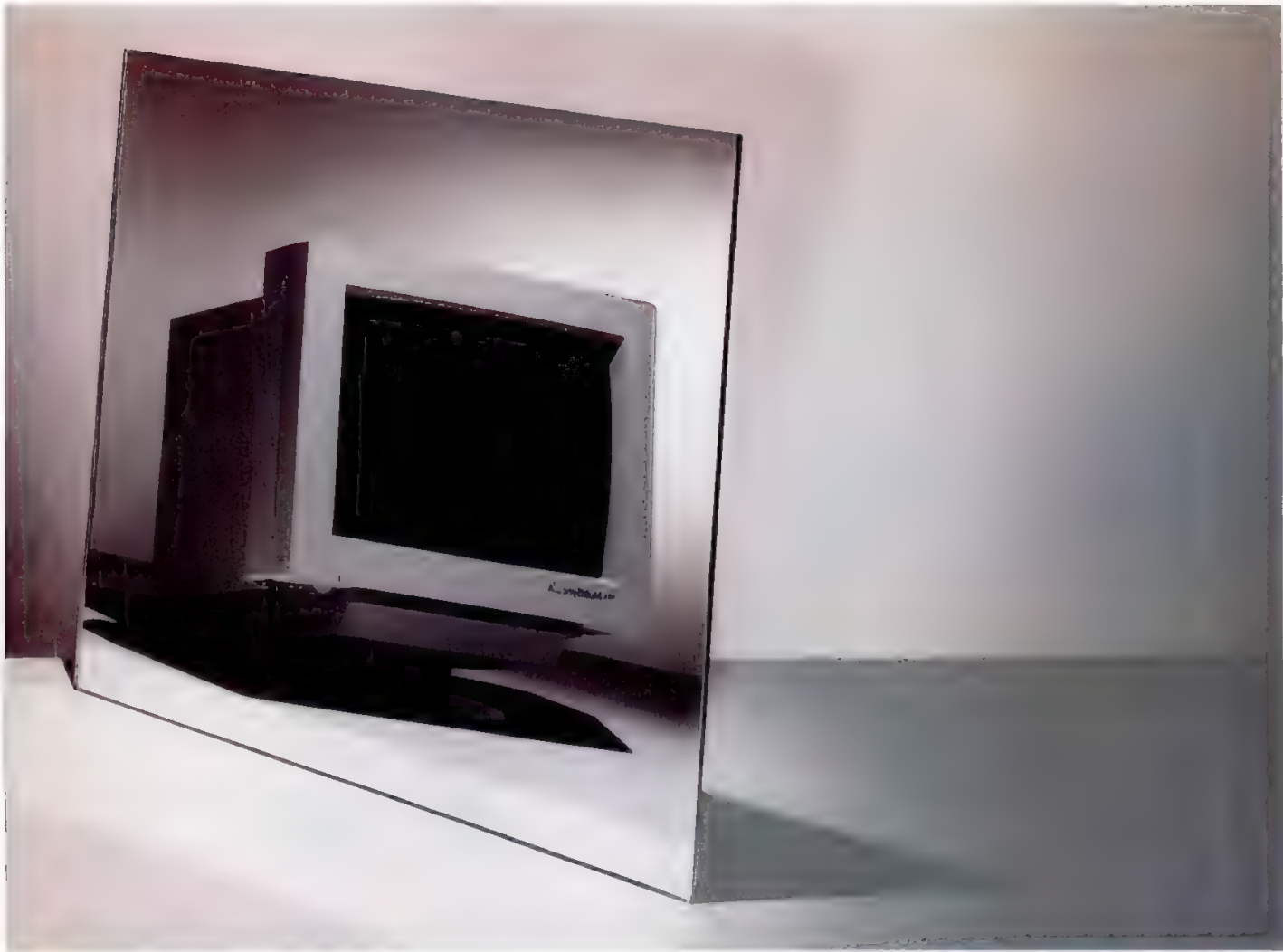
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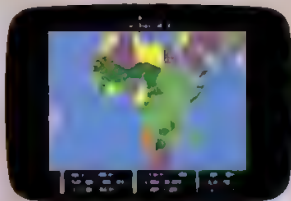
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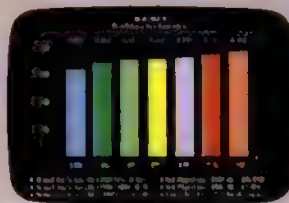
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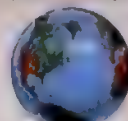
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by
Lori Grunin

Advisor

DIRECT ACCESS

Reading Edward Mendelson's review of *The Norton Backup* (First Looks, May 29, 1990) prompts me to inquire about a subject I would like to know more about: DMA—Direct Memory Access. My present understanding of DMA is that it's a method where data can be transferred between peripheral devices and internal memory without CPU intervention. Top-selling data backup programs use this DMA method and tout it as their *high-speed* mode. I feel most PCs don't have DMA capability and the owners are unaware of this, and think they can back up faster with comparable integrity to the standard DOS mode.

How does one find out or detect if his PC has DMA capability?

Tom Takesian

Annapolis, Maryland



While you're right on target about the definition of DMA, its implementation is a lot more common than you think; almost every PC and PS/2-compatible machine have DMA capability built-in, and have since the first Intel 8237 chip appeared on the original PC's systemboard. For that matter, it's not just used by peripherals—floppy drives use DMA, and one of the DMA channels facilitates memory refresh. Peripherals, such as CD-ROM drives and hand scanners, also utilize DMA. Unlike IRQs, you can have more than one device assigned to a given channel, as long as the devices will never be used simultaneously.

The number of DMA channels you have depends on your platform. For instance, PCs have four, two of which are assigned to the aforementioned tasks. AT-compatibles have three additional free channels.

What may confuse you is the "DMA test" that some software may run during setup. But that's not to test for the presence of a DMA controller; it's to test the system's DMA capacity. Just as not all

- **DIRECT ACCESS:**
How DMA is used.
- **AN ABUNDANCE OF SOURCES:**
More places to find industry information.
- **REVVING UP YOUR PS/2:** Boards that turn your MCA-bus 286 into a 386—and beyond.
- **PINT-SIZED LAN CONNECTOR:**
A LAN adapter that uses your computer's parallel port.

serial ports can handle data transfer at the maximum possible 115,200 bits per second, not all systems can handle the speediest DMA operations. *Norton Backup*, for example, simply tests to see if your machine can handle file copying at the maximum setting. If not, the program sets it to a lower speed.

For an in-depth, programmer's-level discussion of DMA, check out Lewis C. Eggebrecht's *Interfacing to the IBM Personal Computer*, Second Edition (\$21.95; Howard W. Sams and Co., Macmillan Computer Publishing Division, 11711 N. College Ave., P.O. Box 775, Carmel, IN 46032; (800) 257-5755 (orders), (800) 257-8247 (customer service)).

AN ABUNDANCE OF SOURCES

In the *Advisor* column in the June 26, 1990, issue of *PC Magazine*, a reader wanted information about directories of hardware and software companies. I'd like to append a couple of sources to that answer.

The National Association of Computer

Dealers (NACD, 13103 FM 1960 W. #206, P.O. Box 690029, Houston, TX 77269; (800) 223-5264) publishes an annual *Computer Blue Book* (\$15.95) that contains price quotes for used equipment, as well as names, addresses, and phone numbers for manufacturers, distributors, publishers, service companies, and used computer dealers. In addition, the NACD puts out *The NACD National Directory: The Official Computer Yellow Pages* (\$69.95), a compilation of names, addresses, and phone numbers for distributors, end-user sales operations, manufacturers, publishers, rental companies, retail stores, service and repair firms, VAR and OEM companies, and used computer agents, brokers, and stores. Similar to the *Yellow Pages* we all know and love, this directory contains advertisements and is broken down according to category, such as "video cards—monochrome."

At \$695 for a one-year subscription (with monthly updates), *HardFacts on Disk* (HardFacts, 292 Cabot St., Beverly, MA 01915; (508) 927-1370) isn't for everyone. On the other hand, if you need price and configuration information for a range of hardware products in addition to the names, addresses, and phone numbers of the firms that sell them, then you should check out this database.

HardFacts gives you street as well as list prices, abstracts of articles written about a selected item and awards presented to it, and complete distribution channel information—including mail-order sources for any given product, with each house's price as of the last update. You can search over each record by specification; for example, you can find an 80386-based machine that comes standard with VGA, 1MB RAM, and a one-year warranty. If you need more information about a product, you can call the provided fax number (or just make a regular phone call), and HardFacts will send you supporting spec sheets.

Right now the pickings in *HardFacts* are pretty slim—6,000 products isn't as

Advisor

many as it seems. The database collection takes about 6MB of hard disk space, and it requires a machine with an 80286 processor or better. But if you frequently need to shop around for equipment, it can be a real time-saver (even in its slender state), and it will only get plumper as the year goes on.

REVVING UP YOUR PS/2

We presently own a 286-based PS/2 machine (Model 60) and are interested in upgrading to a 386-based system. Although a number of 386 add-in boards exist for any XT-type machine, we are unable to find such a product for the PS/2. Do you know of any?

John F. Lazarony
Hudson, New York



You should get up to speed fairly quickly with one of AOX's MicroMaster boards (486 Totten Pond Rd., Waltham, MA 02154; (617) 890-4402). The boards come in two 16-

bit models, each with 0K RAM, expandable to 8MB, and a hardware cache: the 386-20 (\$1,495) and the 386-25 (\$1,795). AOX is also planning to release full 32-bit 25-MHz i486-based and 386-33-based versions in the fall if you're feeling really power hungry. The adapters can also access the 16-bit memory on your system board.

The MicroMaster cards are more than just upgrade boards. They use bus mastering, so they can parallel process with the 80286 chip currently in your system. With the 16-bit cards, your old 80286 performs all low-level I/O functions. The 32-bit cards promise true parallel processing; for example, you could run OS/2 off the board and DOS off the motherboard. As it is, you can toggle between processors.

PINT-SIZED LAN CONNECTOR

I am looking for a product that will allow me to connect a laptop PC to a Token-Ring network. Is there any device that would allow me to connect to the network through the serial or parallel port on the laptop?

Paul Mollins
Moncton, New Brunswick
Canada



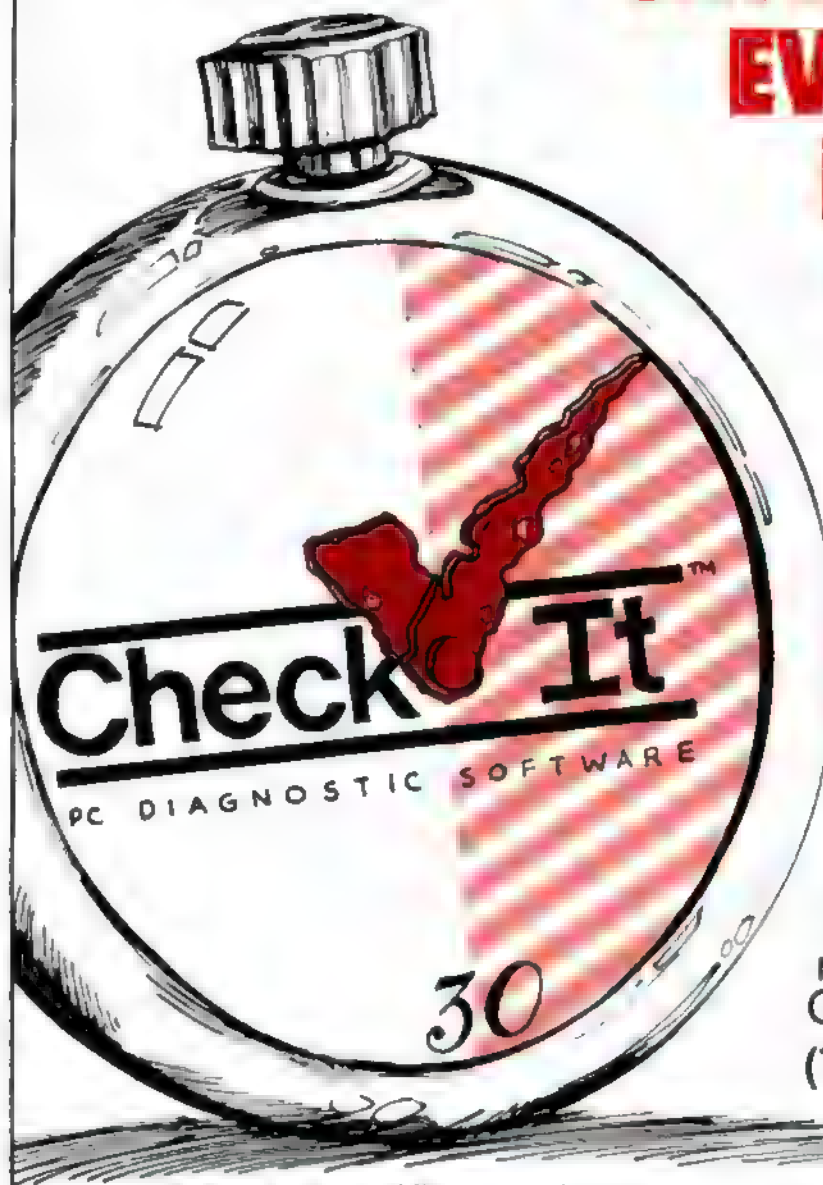
It just so happens that the product you've described is alive and well and living in California; it's Xircor's Pocket Token-Ring Adapter (\$845; 22231 Mulholland Hwy., #114, Woodland Hills, CA 91364; (800) 874-7875, (818) 884-8755). You simply connect the 5-ounce adapter to your parallel port, then transmit away at a claimed maximum rate of 4 megabits per second. It uses an external power supply and comes with drivers for Novell, Banyan, and 3Com networks, among others.

We looked at the unit's elder sibling, the Pocket Ethernet Adapter, on page 38 of the October 31, 1989, issue of *PC Magazine*. The company also markets an ARCnet (\$395), and 10BaseT and 10Base5 Ethernet (\$595) versions of the Pocket Adapter.

ASK THE ADVISOR

Send your questions to Advisor, *PC Magazine*, One Park Ave., New York, NY 10016, or upload them to PC MagNet (see the "By Modem" sidebar in the Utilities column for access information). Please specify your equipment. Unfortunately, personal replies are not possible. ■

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- *Info World*, "We find the ZEOS 386 an excellent value. Speed: Excellent. Compatibility: Excellent. Value: Excellent."
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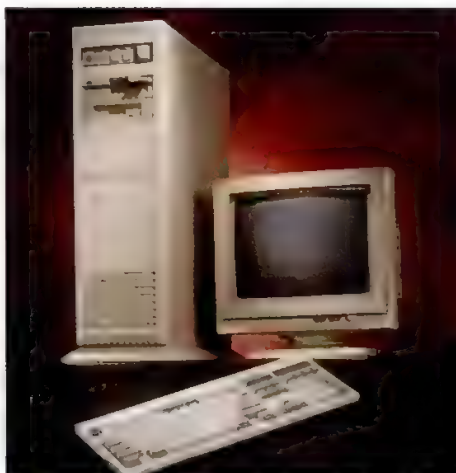


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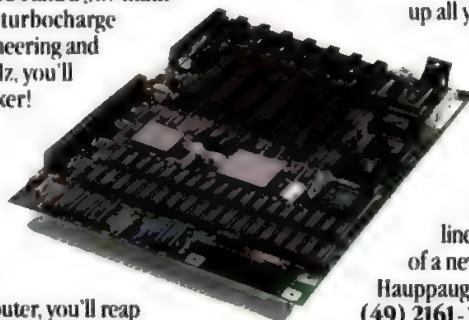
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CIRCLE 276 ON READER SERVICE CARD

First Looks

Hands-on Reviews of the Latest Products

LAN Manager and NetWare Mature: Upgrades Raise Stakes

HANDS ON
by M. Keith Thompson

NetWare 386 3.1 and *LAN Manager 2.0* define PC networking in the '90s. In their latest revisions, each has matured into a solid product ready to meet the demands of an expanding market. *PC Magazine* has, up to now, always seen *NetWare* as the odds-on favorite (see *Multi-tasking LANs*, May 29, 1990) but the race between the two is suddenly neck and neck. The user wins since both now provide all of the components necessary for designing powerful server-based applications.

Historically, most PC network servers functioned as shared peripheral managers. Network users ran standalone,

or at best network-aware, applications designed according to restrictions imposed by the network operating environment. More recently, the buzzword in LAN operating systems circles has been client/server computing. These releases bring us closer to making that buzzword a reality.

Novell holds about 60 percent of the PC LAN market, mainly because *NetWare* was first, fastest, and best. The original *LAN Manager* was not powerful enough to take a significant share of the market from *NetWare*. *LAN Manager 2.0* now matches *NetWare 386 3.1* feature for feature, even passing it in certain areas. In fact, the only major advantage *NetWare 386 3.1* has over *LAN*

Manager 2.0 is speed.

NetWare has offered fault-tolerance and uninterruptable power supply (UPS) support for years. *LAN Manager* now adds these as standard features. Security is another area where *LAN Man* has caught up. The original *LAN Manager* lacked adequate security features; the new version matches *NetWare's* security.

Here's a look at each of the systems in detail:

Installing Microsoft's *LAN Manager 2.0* is relatively quick and painless. Since it requires *OS/2 1.21*, you must first install the operating system, then use *Setup* to install the network software. The program is menu-driven and asks simple ques-

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A Driver? A Font Generator? A Spooler? It's SuperPrint!

HANDS ON
by Barry Silver

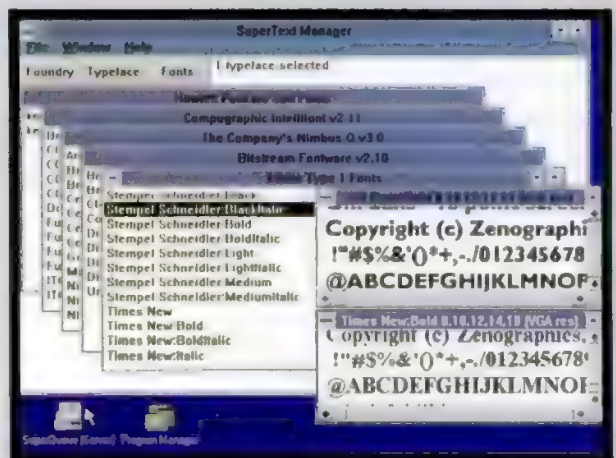
Windows 3.0 does many things well; printing is not one of them. *Zenographics' \$195 SuperPrint* does a number of things to rectify the situation. Primarily it's a *Windows 3.0* replacement printer driver for users of HP LaserJets, DeskJets, PaintJets, and compatibles. In addition, it provides several enhancements including built-in scalable typefaces, an improved print spooler, and a screen font generator.

The *SuperPrint* driver relies on its own rasterizer, which *Zenographics* calls *SoftRIPS*. Essentially *SuperPrint* rasterizes the entire printed page

(both graphics and text). Because the page is a raster image, *SuperPrint* can use scalable fonts and adjust the dithering patterns on graphics. On the other hand, text printing is actually slowed down, and you are unable to use font cartridges or internal printer fonts.

As our tests indicate, using *SuperPrint's SuperQueue* print spooler ameliorates the disadvantage associated with printing text as a bitmapped graphic. The spool files that *SuperDriver* creates are in compressed format and are more controllable than those from the *Windows Print Manager*. *SuperQueue* also allows you to print in the background more efficiently.

However, even with *Super-*



In addition to providing a replacement driver for *Windows*, *SuperPrint* supports five type foundries and lets you preview the screen fonts it produces.

Queue, the background print process is lengthy. It's best to use your PCL driver to print long simple text files and use

SuperPrint for mixed graphics/text pages. Fortunately, the *Windows Control Panel* makes

CONTINUED ON PAGE 34

First Looks

SuperPrint

CONTINUED FROM PAGE 33

it easy to switch printer drivers. SuperQueue can also spool files to disk for later printing.

The spooler, which gives up control to the foreground program, is a timesaver, but it's not perfect. At the start of a complicated print job, especially ones that used several font translators, the spooler takes control for 10 or 15 seconds.

SuperPrint's font handling capabilities let you manage fonts from a number of different sources. In addition to standard downloadable bitmapped HP fonts, four types of outline fonts are supported: Bitstream's Fontware, PostScript (including Adobe Type I with hints), AGFA-Compugraphic's Intellifont and The Company's NimbusQ (URW typeface library). Note that while Intellifont is the format behind the LaserJet III's scalable outline fonts, **SuperPrint** uses the native FIAS, which is not the format most vendors of LaserJet III fonts are shipping.

To get you off and running, Zenographics bundles 22 scalable fonts: 5 full families (the equivalents of Times, Helvetica, Courier, Century Schoolbook from URW, and Futura from Compugraphics) together



PERFORMANCE TESTS: SUPERPRINT WITH SUPERQUEUE

Our Labs performance tests indicate that **SuperPrint** boosts printing performance, with two exceptions. Large, single font documents and bitmap art incur additional delays over normal PCL (printer control language) output without the SuperQueue feature enabled. With SuperQueue enabled, the speed up in printing line art and printing text with multiple fonts is especially dramatic.

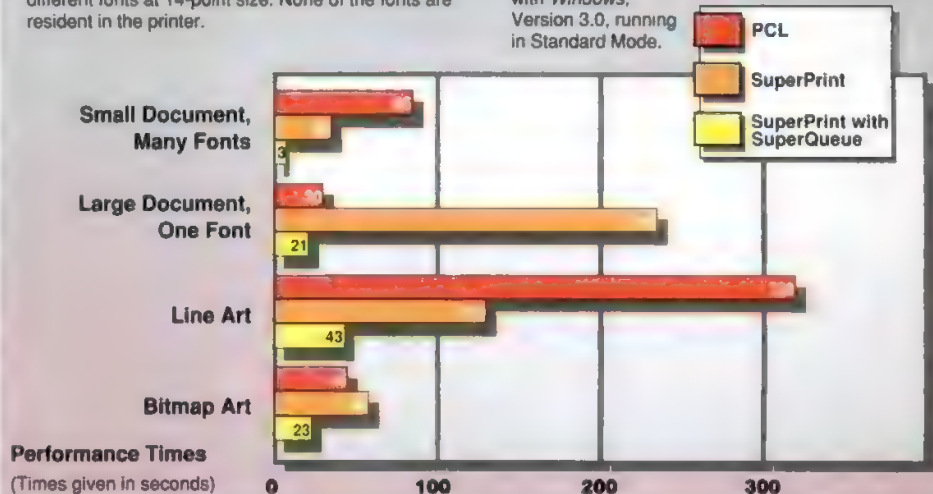
The **Small Document, Many Fonts** performance test prints from a *Word for Windows* 9-line file with 9 different fonts at 14-point size. None of the fonts are resident in the printer.

The **Large Document, One Font** test prints a 5-page *Word for Windows* document with one 12-point font not resident in the printer.

The **Line Art** performance test prints a vector graphic from *CorelDRAW*.

The **Bitmap Art** performance test prints a bitmapped graphic, a 256-gray-shade TIFF file from *PageMaker*.

All tests were performed on a 25-MHz Northgate Elegance 386 with 15MB RAM printing to a Hewlett-Packard LaserJet III with *Windows*, Version 3.0, running in Standard Mode.



with a single Bitstream Charter and a URW symbol font.

To assess font management, we tested several Bitstream fonts, PostScript fonts from both Adobe and Monotype, the URW fonts shipped with ZSoft's *SoftType*, and Intellifont outlines shipped with HP's *Type Director* and provided by MicroLogic, the makers of *More Fonts*. All worked admirably except for the FAIS files from MicroLogic—both vendors involved were working on rectifying this incompatibility. Version 1.5 of ZSoft's *Publisher's Type Foundry*, which should be out when you read this, and a future version of *SoftType* will output URW outlines and provide another source of **SuperPrint** usable fonts.

Screen font generation is handled by the SuperText part of the program. Unlike the **SuperPrint** engine, which scales the fonts on the fly and does not use additional disk space or *Windows* resources, SuperText's screen fonts are bitmapped fonts, stored on disk at

fixed point sizes.

SuperText can also install fonts into **SuperPrint's** list. One nice touch lets you change the name of any font and have your *Windows* applications make use of the new name. This makes it easy to exploit multiple weight fonts—with an Adobe font that comes in four weights, I simply changed names to two different families.

Although easy to use, SuperText is the weakest element of the package. You cannot produce screen fonts for any pure HP bitmapped fonts. In fact, I couldn't get **SuperPrint** to recognize some of my matching screen fonts, although they printed perfectly. For users who only use outlines fonts, this will not be a problem.

The production of screen fonts slows down as the program inexplicably rebuilds a support file several times but, since you can do font building in the background, this is not a serious problem. SuperText uses DOS batch files rather than *Windows* during the installation

of Bitstream and Compugraphics fonts, and things get awkward if you want to install more than one character set for a single font as you might with Dingbat fonts.

Meanwhile, Zenographics is expanding its support for other printers. Drivers with identical font metrics for several other printers including CalComp color printers and Techtronics 4693DX are available. Drivers for additional printers are under development.

Other *Windows* font packages will be available soon. *Adobe Type Manager* will link to PostScript Type 1 fonts; Bitstream's *FaceLift* will manage Bitstream Speedo outlines. Microsoft will include TrueType in a future version of *Windows*. All three provide on-the-fly outlines for screen and printer fonts. Since **SuperPrint** doesn't provide on-the-fly screen fonts, and the other programs do not address graphics printing speed, you'll probably want **SuperPrint** as well as one of the other solutions. ■



FACT FILE

SuperPrint, Version 1.0
Zenographics, 4 Executive Circle, #200, Irvine, CA 92714; (714) 851-6352.
List Price: \$195.

Requires: Microsoft *Windows* 3.0 (a limited version is available for *Windows* 2.x), HP LaserJet, DeskJet, or PaintJet printer.

In Short: A replacement printer driver for *Windows* which provides access to four families of outline fonts, display screen font generation, and dramatically faster graphics printing. A must for *Windows* users with HP family printers who do more than print simple text.

CIRCLE 430 ON READER SERVICE CARD

First Looks

LANs

CONTINUED FROM PAGE 33

tions about your server's configuration. Installation took only 35 minutes, including formatting the fast 320MB SCSI hard disk with the High Performance File System (HPFS) on our NCR PC486/MC33. Upgrading from earlier versions is also easy.

LAN Manager provides extra flexibility by allowing two types of security: **USER** and **SHARE**. **SHARE** allows you to assign a password to a resource on the network. Anyone with the password can access that resource. The more conventional **USER** security (which is similar to *NetWare's*) provides each user with a unique password. Thus, the administrator controls access to resources by assigning access rights.

Three advantages **LAN Manager 2.0** has over *NetWare 386 3.1* are multiple processor support, more server-based applications, and global naming services. **LAN Manager 2.0** has built-in support for two processors. One runs the file system along with the transport protocol. The other runs the server-based applications. **SQL Server** is a good example of server-based software that's now available for **LAN Manager** but absent from *NetWare 386 3.1*. And, the global naming service lets administrators manage access to multiple servers from a primary domain controller.

In the past, Microsoft sold **LAN Manager** only through OEM's, like IBM, 3Com, and NCR, providing a partial product for OEM customization. With **LAN Manager 2.0**, Microsoft offers a shrink-wrapped version that's ready to run and is available from dealers throughout the country. To boost the effort, it is recruiting many new employees to handle **LAN Manager** support calls and dealer training.

Novell's *NetWare 386 3.0* was a warm-up act for 3.1. Novell brought its next generation operating system to market before it included all of the neces-



BENCHMARK TESTS: NETWARE VERSION 3.1 & LAN MANAGER 2.0

PC LAN Lab's Network Load test shows that *NetWare* has an overall speed advantage, although detailed analysis of the results show some interesting differences. *NetWare's* transmission and file-handling protocols excel at moving small packets. Our *NetWare* server moved 512-byte data requests, typical of many current PC applications, at a rate of 1.2 megabits per second (Mbps) while the same machine running **LAN Manager** delivered small packets at 0.7 Mbps. However, when using 16K byte blocks, typical of **SQL Server** and communications programs, **LAN Manager** clocked 2.5 Mbps while *NetWare* stayed at 1.5 Mbps. The

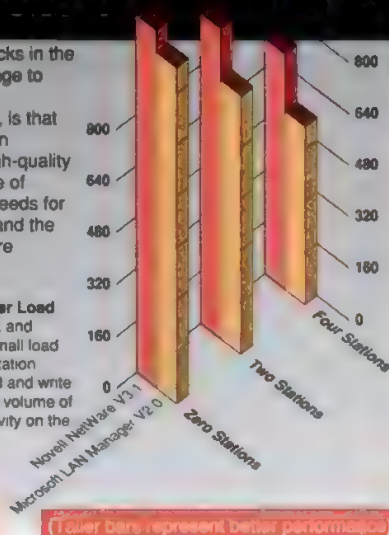
greater number of small blocks in the test give the overall advantage to *NetWare*.

The bottom line, though, is that speed is a minor factor when choosing between these high-quality operating systems. The type of applications you run, your needs for server-based applications, and the support you receive are more important than throughput.

The **Network Throughput Under Load** test loads network cards, media, and access protocols but places a small load on the server. While the timed station transfers files, load stations read and write 1-byte data files, creating a high volume of data packets and increased activity on the network.

Network Throughput Under Load

	Zero Stations	Two Stations	Four Stations
Novell NetWare V3.1	1293.47	1228.8	1137.78
Microsoft LAN Manager V2.0	1041.36	910.22	853.33



sary features. To make amends, all current 3.0 users receive a free upgrade to 3.1.

NetWare 3.1 includes the features that expand the operating system. The new release includes support for Sun Microsystems' NFS and Apple's AFP file systems so that users of these computers can store their files on a *NetWare 386 3.1* server. Novell adds support for removable media allowing vendors to write drivers for CD-ROM's and products like Iomega's Bernoulli Box. **LAN Man** also has these capabilities running under OS/2.

Novell fine-tuned its already speedy file system to squeeze extra performance by optimizing many repetitive routines. Mounting volumes is three times faster, 3.1 does not cache deleted files, and the disk drivers are rewritten. For example, where deleting users or groups from the bindery used to take 2 minutes, it now takes 4 seconds.

Upgrading from 3.0 to 3.1 couldn't be easier. You simply put "System Disk-1" in drive A and "LOAD A:INSTALL." Fifteen minutes later you're finished. *NetWare 386 3.0* could upgrade only from Version 2.15, but 3.1 users can upgrade from servers as old as 2.0a.

Version 3.0 offered some limited support for NLMs; in

3.1 NLMs have complete functionality. Version 3.1 includes the **Btrieve**, remote console, and print services NLMs. The **Btrieve** NLM is a high-performance key-indexed record manager. The remote console NLM allows system administrators to monitor server information from their workstations, and the print services NLM provides spooling and queuing of print jobs for up to 8 printers. Again, **LAN Man** provides the ability to add these functions via OS/2.

On the workstation side, *NetWare 386 3.1* has many enhancements. OS/2 client stations now have full IPX/SPX, **NetBIOS**, and Named Pipe support. DOS users will be pleased that the software can finally unload **NetBIOS** and workstation software to free memory when you don't need the network. The new shell also supports expanded and extended memory.

LAN Manager and *NetWare 3.1* are top-notch products. Microsoft rose to the challenge, designing a powerful competitive LAN operating system. Now it will need to provide marketing and support. *NetWare 3.0's* speed, huge storage capacity and minimum degradation under heavy loads promise a rich environment for a new generation of server-based applications.



FACT FILE

NetWare 386, Version 3.1
Novell Inc., 122 E. 1700, S. Provo, UT 84606; (800) 453-1267, (801) 379-5900.

List Price: \$7,995.

Requires: i386 i486 processor, 3MB RAM (6MB recommended), DOS 3.x, supported hard disks.

In Short: The next generation of Novell's network operating system offers simple installation, dynamic self configuration, and virtually unlimited file systems capabilities. It makes an excellent operating system for server-based applications with NLM's.

CIRCLE 881 ON READER SERVICE CARD

LAN Manager 2.0

Microsoft Corp.
One Microsoft Way, Redmond, WA 98052-6399; (206) 882-8080.

List Price: \$5,995.

Requires: Server version: 80286 i386 i486 processor, OS/2 1.21, 6MB RAM (9MB recommended), 6MB disk space; OS/2 Workstation: 80286 i386 i486 processor, OS/2 1.1 or higher, 3MB RAM (4.5MB recommended), 5MB disk space; DOS Workstation: 512K RAM (640K plus extended or expanded recommended).

In Short: **LAN Manager 2.0** has important features for a network operating system: excellent security, a fast large-capacity file system, fault tolerance, and multitasking for server-based applications.

CIRCLE 882 ON READER SERVICE CARD

First Looks

DR DOS 5.0—An MS-DOS Clone with Charisma

HANDS ON
by Ray Duncan

Digital Research Inc. (DRI) traveled a rocky road on its way to creating a successful DOS clone. Its first efforts produced a weird amalgam of CP/M-86 and DOS emulation that found little acceptance in the DOS world. More recently, DRI honed in on true compatibility with the DOS standard and enjoyed significant success penetrating the market for ROMable DOS. Digital Research's latest and finest product, the \$199 DR DOS 5.0, confronts Microsoft on its own ground.

DR DOS 5.0 is an almost-perfect superset of MS-DOS 3.3 and 4.0. In the course of a normal day's work you probably wouldn't notice any difference between how you'd interact with MS-DOS or DR DOS. I found no compatibility problems with a broad selection of applications including several word processors, programming tools, debuggers, TSRs, DOS extender applications, 3Com network software, the various *Norton Utilities*, and (to my surprise) *Windows 3.0*.

Beyond that, DR DOS 5.0 leapfrogs MS-DOS 3.3 and 4.0 in some important ways. It provides a disk cache that can use either extended or expanded

memory. It has a FILELINK utility that can ship itself over a serial communications link to a second computer and then transfer files in either direction. It allows the display of prompts, keyboard entries, and the conditional execution of CONFIG.SYS directives at system boot time. And it contains features especially for laptops, including a command to set the size and blink rate of the cursor, and the ability to minimize battery drain by monitoring and powering down peripherals.

DR DOS's SETUP program is far superior to anything that has ever been supplied with MS-DOS, even better in several respects than that of the widely acclaimed *Windows 3.0*. It's a full-screen, interactive, menu-driven program that is fast, visually attractive, and forgiving of errors; it almost completely insulates the novice from CONFIG.SYS and AUTOEXEC.BAT arcana.

When DR DOS is installed "over" a previous version of MS- or DR DOS, it seeks and replaces all of the DOS utility programs, wherever they might reside on the fixed disk. Best of all, SETUP copies itself to the DR DOS directory during installation, so that it can be reinvoked at any later time to reconfigure the system.

The command line interface has been extended. Every command has on-line help, which is requested by entering the command's name followed by a /H switch. New utilities such as PASSWORD (which provides file and directory protection), TOUCH (which modifies a file's time and date stamps), XDEL (which can recursively delete subdirectories and their files, or overwrite a file before erasing it so that it cannot be "unerased"), and XDIR (which produces directory listings sorted by file name, date and time, or size, and can also include or exclude files by their



CUA-compliant or GEM derivative? DR DOS's VIEWMAX shell is the only weak link in DRI's powerful DOS replacement.

attributes) all fill gaps in the MS-DOS command set. EDLIN (may it rest in peace) is replaced by a compact, speedy visual editor. Lastly, DR DOS supports a command line "history" facility that buffers all recently entered command lines so that they can be recalled, edited, and reissued.

The efficient use of memory is equally impressive. When available, most of the DR DOS kernel can be relocated into the high memory area (HMA), increasing the amount of memory available for applications below the 640K boundary. On 80286 machines based on the NEAT or LEAP chipsets, or on 80386 or 80486 machines, DR DOS can also remap extended memory into the "holes" between 640K and 1MB, allowing device drivers and TSRs (as well as the DR DOS kernel) to be loaded above the 640K limit. In addition, VCPI-compatible EMS 4.0 emulation is supported on 80386- or 80486-based PCs. Taking full advantage of these capabilities requires some experimentation, but it's worthwhile—when I finished, a CHKDSK under DR DOS 5.0 running on my Dell 316SX showed 587K of conventional memory available, as opposed to 462K under MS-DOS 3.3.

DRI especially caters to OEMs, systems integrators, and embedded systems developers who want to customize and/or resell DR DOS. A \$300, *System Builder Kit (SBK)* includes

source code for the basic device drivers, an IBM-compatible ROM BIOS, a skeletal ROM BIOS for noncompatible systems, and a sample battery-saving and power-control module. This kit can be used to build a new DR DOS system to execute from disk, ROM, EPROM, or Intel's new FLASH memory.

The only component of DR DOS that I didn't particularly care for was its shell, VIEWMAX. Though DRI bills VIEWMAX as CUA-compliant, it still looks like GEM to me. Furthermore, VIEWMAX suffers from many of the same problems as the MS-DOS 4.0 shell—it looks somewhat like a graphical user interface until you use it and discover that it's not fast, powerful, or intuitive.

The DOS market continues to grow; the success of *Windows 3.0* and DOS extenders make it likely that DOS will remain the dominant PC operating system for many years to come. Digital Research appears determined to capture a sizable chunk of this lucrative market.

Although DR DOS costs more than MS-DOS, it bundles several programs that would have to be purchased separately by MS-DOS owners: a disk cache, an extended memory manager and EMS emulator, and a PC-to-PC file transfer utility. It will be interesting to see how Microsoft responds to the challenge of DR DOS 5.0 when it releases MS-DOS 5.0 later this year.

FACT FILE

DR DOS, Version 5.0

Digital Research Inc., 70 Garden Ct., Monterey, CA 93942; (800) 848-1498, (408) 649-3896.

List Price: \$199.

Requires: 256K RAM.

In Short: A highly compatible DOS clone with significant advantages over MS-DOS 3.x or 4.0 in its installation, memory utilization, command line interface, and provisions for customization.

CIRCLE 683 ON READER SERVICE CARD

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CIRCLE 299 ON READER SERVICE CARD

First Looks

FastCAD 3D with RenderMan: The Shape of CAD to Come

HANDS ON
by Jeff Prosser

Many high-end CAD packages with roots in the 2-D world suffered in the transition to 3-D, forfeiting speed, versatility, and ease of use. One package that has weathered the change well is *FastCAD 3D*, the \$2,995 3-D version of Evolution Computing's venerable *FastCAD* design software.

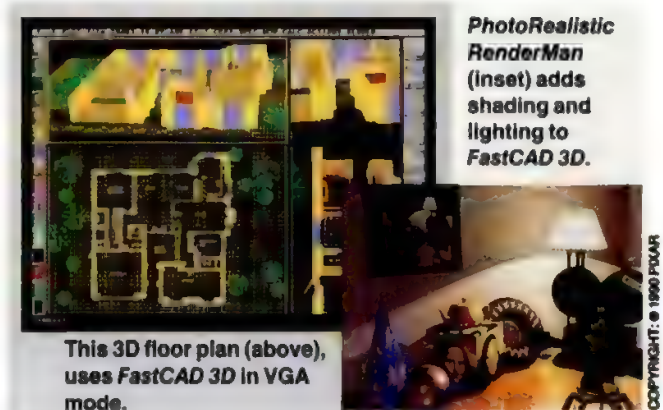
The new *FastCAD* is fast like the old one (it still bears the distinction of being the *only* high-end CAD program written entirely in assembly language), but laden with features for 3-D geometric modeling and construction. You won't find any chinks in *FastCAD*'s 3D construction armor; all entities are inherently 3-D and may be created in any 3-D orientation.

FastCAD 3D retains the functionality of *FastCAD 2D*, so you can use it for mechanical part drawings, floor plans, and electrical schematics (a stand-alone version of *FastCAD 2D* comes with the 3-D product). The 3-D version also has most

of the features you expect from drafting systems, including associative dimensions, multiple viewports, customizable menus, snap commands, 256 different layers, and a wide variety of entity types. The easy-to-use *FastCAD* interface remains familiar, with an icon bar down the right side of the screen and a color bar down the left.

The 3-D version features an extra icon bar that offers additional options. The new icons provide shortcuts to 3-D-only commands such as zoom forward and zoom back. Other new commands permit you to add 3-D surfaces and solids such as spheres, cylinders, rules, meshes, Coons patches, and surfaces of revolution to any model. Still others offer perspective and orthographic views from any viewpoint and direction, extrude planar entities into three dimensions, hide lines and surfaces for more realistic imaging, and create animated flybys. A stereo command gives viewers with stereo glasses the full 3-D effect.

With expanded memory



This 3D floor plan (above), uses *FastCAD 3D* in VGA mode.

PhotoRealistic
RenderMan
(inset) adds
shading and
lighting to
FastCAD 3D.

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(from 536K for full-screen VGA up to 2MB for higher resolution), *FastCAD* will display 3-D models with hidden lines and surfaces removed. You also need at least 1MB of expanded memory to generate plots with hidden lines removed.

For generating photorealistic images from geometric models, *FastCAD 3D* comes with *FastCAD RenderMan*, a version of Pixar's *PhotoRealistic RenderMan* adapted for *FastCAD*. (See the sidebar, "PhotoRealistic RenderMan").

Preparing a *FastCAD* model for rendering is surprisingly simple. After you position light sources in the scene and define material properties, *FastCAD* writes a RIB (*RenderMan Interface ByteStream*) file to disk

which can be read by *FastCAD RenderMan*. Exit to the command line and type *RENDER* followed by the name of the RIB file, and *RenderMan* goes to work. Since images can take anywhere from a few minutes to several hours to generate, *FastCAD* provides a Quick Display option that produces a less-detailed image in less time.

By including *RenderMan*, *FastCAD* gives the CAD community a glimpse of things to come. Soon photorealistic images will be the norm in PC CAD software, to the relief of designers who face the task of conveying a complex 3-D design concept on a sheet of paper. The cost of using *RenderMan* is high, but for the right applications, it's easily justified. ■

PHOTOREALISTIC RENDERMAN

The muscle behind *FastCAD 3D*'s lifelike images is *PhotoRealistic RenderMan*, a rendering program from Pixar that adds visual attributes such as surface textures, reflected light, shadows, and even material finishes (wood, metal, and marble, for example) to make models appear much more realistic than they do in typical flat-shaded computer-generated images.

PhotoRealistic RenderMan is an outgrowth of the widely adopted *RenderMan* Interface, a specification for 3-D scene descriptions set forth in 1988 by Pixar (formerly the Computer Division of Lucasfilm) and endorsed by other companies in the com-

puter graphics industry.

Just as PostScript outlines the commands and procedures used to describe a two-dimensional page, *RenderMan* provides a standardized method for describing objects, scenes, lights, and cameras so that photorealistic images can be generated from them.

PhotoRealistic RenderMan is one component of *Developer's RenderMan*, the imaging package Pixar licenses to third-party developers such as Evolution Computing. *PhotoRealistic RenderMan* reads the RIB file generated by *FastCAD* and produces an image using advanced techniques such as antialiasing and texture mapping.

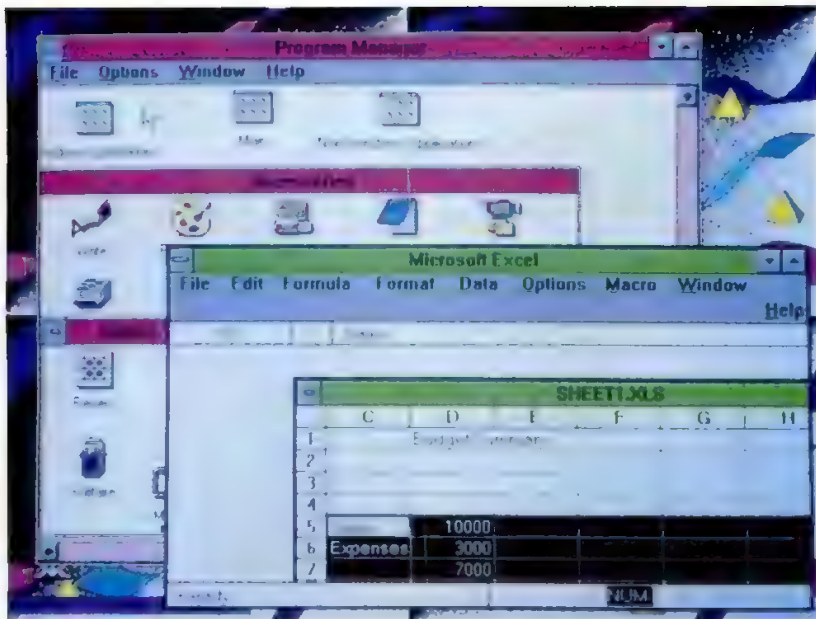
The software relies on shaders to simulate surface textures, material types, and motion blur. The *RenderMan* Shading Language describes how light is emitted from light sources, how it is reflected and transmitted from surfaces, and how it is affected by the atmosphere.

RenderMan supports a limited set of video boards—Truevision's Targa and ATVista boards and IBM's VGA—but more display drivers are coming. Images produced on VGA systems aren't bad (*RenderMan* uses 320 by 200 graphics mode to get the benefit of a 256-color palette), but serious photorealistic imaging needs adapters that offer higher resolutions and more colors.—J.P. ■

**FACT FILE**

FastCAD 3D, Version 2.5
Evolution Computing, 437 S.
48th St., #106, Tempe, AZ
85281; (602) 967-8633.
List Price: \$2,995; includes
FastCAD RenderMan.
Requires: 640K RAM; DOS
2.0 or higher; 8087, 80287, or
80387 math coprocessor;
mouse or digitizer. 3-D
RenderMan: 386/387 or 486;
5MB free disk space; 4MB RAM
(8MB recommended); Targa,
ATVista, or VGA display.
In Short: A 3-D version of
FastCAD offering all the
features of *FastCAD 2D* plus 3-
D construction, hidden surface
and line removal, animation,
and more. Includes a version of
Pixar's *RenderMan* imaging
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CIRCLE 448 ON READER SERVICE CARD



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- 2 serial, 1 parallel & 1 game ports
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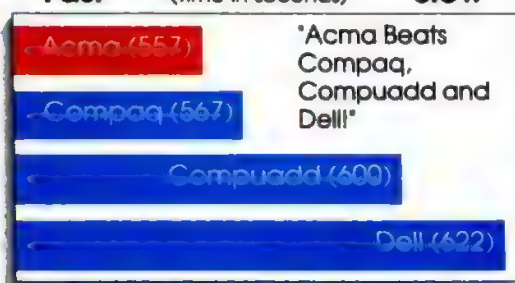
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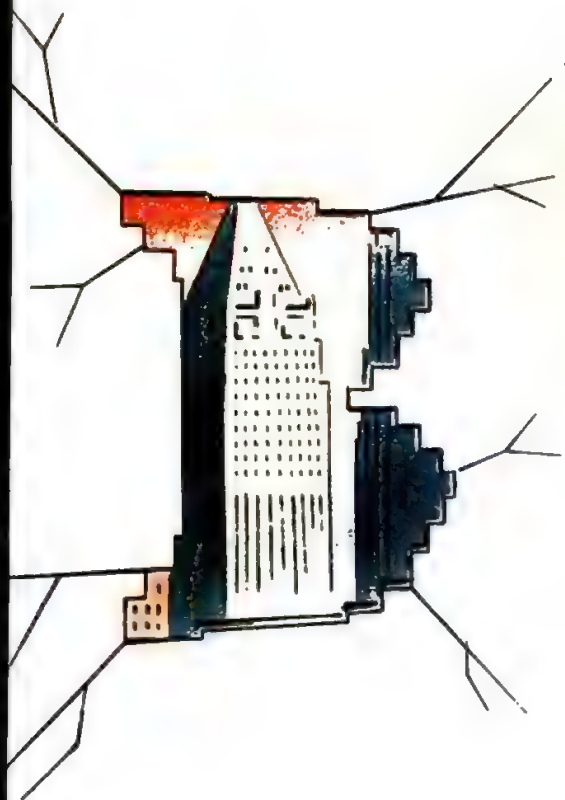
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THE LEADER IN PC TYPE

CIRCLE 131 ON READER SERVICE CARD

First Looks

Two Postscript Cartridges For Your LaserJet Printer:

Hewlett-Packard Takes Top Honors

HANDS ON
by Edward Mendelson

You no longer have to choose between the two industry-standard printer languages, Hewlett-Packard's PCL and Adobe's PostScript. When you plug Hewlett-Packard's LaserJet PostScript cartridge into a LaserJet III, you have the latest and best versions of both standards. Computer Peripherals' JetPage cartridge offers the same capability for less money, but the quality is not as good.

HP's \$695 cartridge, which also works in the LaserJet IIP and IID, but not the Series II, is the first printer hardware to incorporate *Adobe Type Manager* (ATM) font-rendering technology. This produces sharper and clearer type in small sizes than any previous PostScript interpreter that fits on a desktop. ATM, first used in the Macintosh to provide smoother screen fonts, can also provide smoother text on the printed page. The results make all previous desktop PostScript printers look like dot-matrix models by comparison. (Naturally, the ATM in the cartridge won't improve your PC screen fonts. For that you'll need to wait for Adobe's PC software scheduled for release later this year.)

You'll need at least 1MB of additional plug-in RAM to use the HP cartridge in a LaserJet IIP or III, and 2MB to use it in a LaserJet IID. Double those figures if you want to print on legal-size paper, or use the IID for two-sided printing. Still, add-in RAM is now so cheap that the combination of a LaserJet, PostScript cartridge, and RAM card builds one of the least expensive and most versatile printers on the market. And with the resolution-enhancement technology in the LaserJet III, your output is superior to that of any other

300-dot-per-inch PostScript printer.

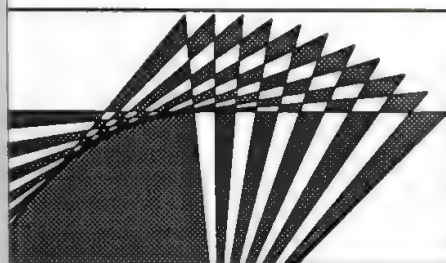
Compared to rival PostScript cartridges like Pacific Data Products' PacificPage (reviewed in First Looks, November 28, 1989) and Computer Peripherals' new \$495 JetPage, HP's cartridge has only one drawback. To switch a LaserJet from PostScript to native PCL

3MB of RAM, the HP model took 1 minute and 15 seconds to print a page consisting of complex graphics and multiple fonts. The JetPage took 5 minutes. (A recent version of PacificPage needed 2 minutes.) The HP cartridge's memory management allows it to use more soft fonts on the same page, and to do so faster than the other models.

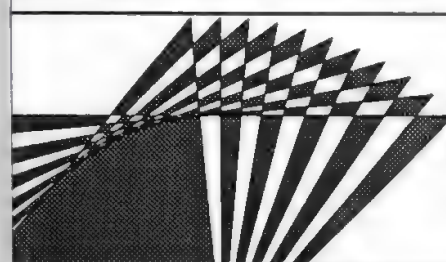
The JetPage works in the same printers as the HP model and has the same RAM requirements; a separate model works in the LaserJet II. Although the JetPage costs \$200 less than HP's cartridge, its speed and type quality make it a questionable bargain. The cartridge's PostScript-compatible inter-

formed. (Notice the crude Times Roman "m" and "n" in the print sample.) The Nimbus-Q font-rendering technology used to interpret Type 1 fonts produces thicker and coarser type than you get with Adobe's font-rendering. Not long after you read this, Computer Peripherals plans to release a version that corrects the rendering problem and increases print speed.

List Price: Hewlett-Packard LaserJet PostScript cartridge, \$695. **Requires:** LaserJet IIP or III, with 1MB additional RAM (2MB for legal paper); LaserJet IID with 2MB additional RAM (4MB for legal or duplex printing). Hewlett-Packard Co. Inquiries, 19310 Pruneridge



Times Roman 12
Helvetica 12
New Century Schoolbook 12
Palatino 12
Avant Garde 12
Zapf Chancery 12



Times Roman 12
Helvetica 12
New Century Schoolbook 12
Palatino 12
Avant Garde 12
Zapf Chancery 12

Hewlett-Packard's PostScript cartridge (top) produces far better fonts than the coarse designs in the JetPage (bottom). The JetPage gives you more flexibility than the HP cartridge in networks, and the price is lower, but the performance is slower. HP's PostScript cartridge turns an off-the-shelf LaserJet III into a desktop printer with more quality and flexibility than any other, and at impressive speeds.

mode when using the HP cartridge, you have to turn off the printer and remove the cartridge. With rival cartridges you can switch modes via software commands from the computer or the printer's front panel. Mode-switching options lessen wear on the printer and make the cartridges better suited for network use.

But HP produces better print quality than its rivals, and does it faster. In a LaserJet III with

pre-processor handles complex graphics with aplomb, and, like HP and the PhoenixPage interpreters, can use Adobe's Type 1 soft fonts. But the quality of its internal fonts and its rendering of soft fonts doesn't approach the standard achieved by HP's new Adobe interpreter or the PhoenixPage interpreter in the Pacific Data cartridge.

The JetPage's internal 35 fonts, which are from the URW typesfoundry, are awkwardly

Ave., Cupertino, CA 95014;
(800) 752-0900.

CIRCLE 440 ON READER SERVICE CARD

List Price: JetPage, \$495. **Requires:** Same as Hewlett-Packard cartridge; separate model for LaserJet II requires 1MB additional RAM. Computer Peripherals Inc., 667 Rancho Conejo Blvd., Newbury Park, CA 91320; (800) 854-7600; (805) 499-5751.

CIRCLE 450 ON READER SERVICE CARD

Actor 3.0: Professional Object-Oriented Application Development For Windows 3.0

HANDS ON
by Richard Hale Shaw

GUI applications written for *Microsoft Windows* are infinitely easier to use than their character-based counterparts, but they're considerably more complex to develop. The development problem is twofold. First, traditional *Windows* programming fails to mask the complexity of the *Windows* event-driven, message-based operating environment. Second, you have to learn the *Windows* protocol, using the right *Windows* functions in the right order. Considering that there are over 400 functions in the *Windows* API, this is not a trivial job.

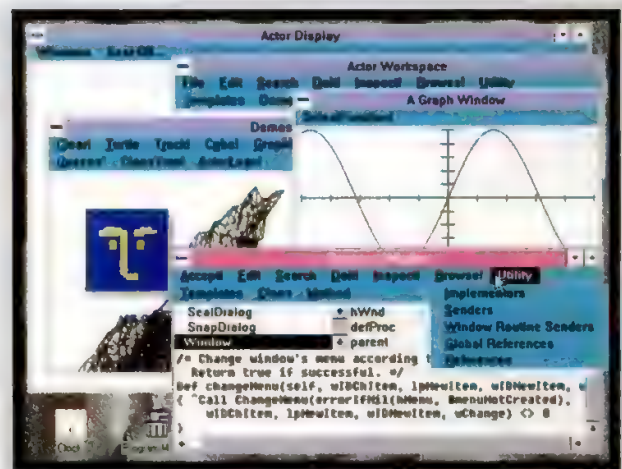
One solution is The Whitewater Group's *Actor* 3.0, a \$695 application development environment for *Windows* 3.0 that takes advantage of the natural synergy between object-oriented programming technology and *Windows*. *Actor* 3.0 is designed for creating complete applications for *Windows* 3.0. Unlike C, where you have to deal directly with the *Windows* API, *Actor*'s programming language interposes a layer between your

application and *Windows*. It shields you from the complexity of the *Windows* API without sacrificing extensibility or elegance and with minimal sacrifice in efficiency.

An abundant set of development tools and a set of over 100 *Windows*-specific class libraries handle the bulk of *Actor*'s interaction with *Windows*. With these, you can create and manipulate standard *Windows* objects such as scroll bars, windows, list boxes and dialogs, as well as use graphics and Dynamic Data Exchange (DDE).

Actor embodies the characteristics of a classical object-oriented programming system. Most *Actor* programming activity revolves around the definition of objects that inherit the methods and instance variables encapsulated into a parent or ancestor class. You tell an object what to do by sending it a message. Polymorphism and late binding let you use the same message across object types. Thus, *Actor* assumes that you will accept the "object-oriented paradigm" and are willing to write applications that are largely *re-active* (waiting to respond to input and events) rather than *pro-active* (actively seeking input and events).

You can extend *Actor* by subclassing your own objects from the classes provided, or by defining them from scratch. In a development environment, you can use class libraries to promote consistent program behavior among all of the applications developed in your organization. *Actor* compiles your code as you write it, so you can immediately test your application. The built-in objects handle so much of the work, that, for a given programming task, you'll write less code than you would in C. Indeed, with fewer than a dozen



Actor's Browser lets you modify, compile, and run methods after selecting them from their object classes.

lines I was able to write an *Actor* *Windows* program that would have taken over 100 lines in C. The *Actor* code performs so well that you will probably only need to use C for the most time-critical tasks.

While *Actor* has been a *Windows*-based product since its inception, Version 3.0 is designed specifically for *Windows* 3.0. With it, you can build applications of up to 2MB in size and run under any of *Windows* 3.0's operating modes. It also offers class library support for *Windows* 3.0 hierarchical menus and combo boxes, as well as inheriting the features of earlier versions.

For instance, *Actor* offers a memory-swapping technology that allows a program to run in as little as 640K (with or without expanded or extended memory), while remaining application-transparent. It includes a facility for calling *Windows* dynamic link libraries (DLLs), custom error-handling, user-defined primitives (written in C or Assembler), plus a host of new object classes.

The tools provided include a Class Browser for creating, viewing, and editing classes, and an Inspector for viewing and modifying object instance variables. An integrated source code Debugger pops up when an error occurs (and can resume once you've corrected the error), and a Profiler is available for identifying program bottlenecks. The full source code for

these tools is included in the package, and—best of all—there are no royalties on applications written in *Actor*.

Unlike recent entries, such as Asymetrix *ToolBook*, that give nonprogrammers an object-oriented environment, *Actor* is decidedly *not* for end users or even power users. It's a professional's tool, replete with the complex facilities and the terseness that they expect. It may take you longer to develop an application with *Actor* than with *ToolBook*, but the level of complexity and variety that *Actor* can manage is greater by an order of magnitude.

Actor is a mature system, but it's not without its problems. This is a single-source language, although The Whitewater Group does offer training and support. The class libraries are so complete that it may take longer than expected to familiarize yourself with its intricacies. Also, while the language is syntactically similar to C or Pascal, it's more complex and obscure than C++. Fortunately, a subset of the classes allows you to be productive before you master the system.

Overall, *Actor* remains the professional's best alternative to writing *Windows* code in C or Pascal. While some have suggested that previous versions were best used as fast prototyping tools, *Actor* 3.0 offers the most complete object-oriented programming system for *Windows* 3.0. ■



FACT FILE

Actor 3.0

The Whitewater Group, 1800 Ridge Ave., Evanston, IL 60201; (708) 328-3800. List Price: \$695 (upgrades, \$75).

Requires: Microsoft Windows 3.0, 640K RAM

In Short: *Windows*-based object-oriented development system for professional standalone applications. The program includes Class, Browser, Debugger, Profiler, and over 100 *Windows* class libraries.

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First Looks

Office 3.0 Automates the Desktop For Users Familiar with WordPerfect

HANDS ON
by Edward Menon

WordPerfect Office combines powerful desktop utilities with functions that integrate *Office* and other applications on a standalone computer or network. *Office PC*, the \$149 single-user version, is an upgrade of *WordPerfect Library*. It includes a calendar, calculator, file manager, database, and an editor that lets you keep up to nine files in memory at once.

You can launch all these programs, and most DOS applications, from a flexible shell and task switcher that can swap applications and TSRs to and from expanded memory or disk at the press of a key. If you use the shell to manage other *WordPerfect* products, its clipboard can transfer graphics and fully formatted text in a way normally possible only in an integrated environment like *Windows*.

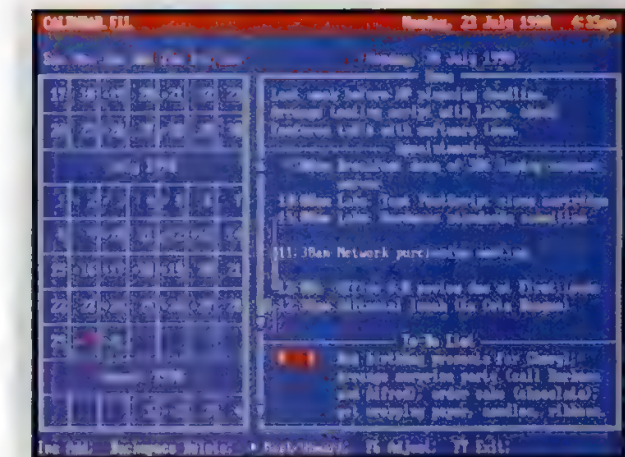
Office LAN is available in 5- and 20-station packages for \$495 and \$1,595. It adds scheduling functions and mail services not in the PC version. A \$695 add-on, *Connections for Office LANs*, circulates mail and scheduling between network hosts. A \$50 *Async Gateway* allows remote copies to communicate across phone lines. There's also a \$695 gateway for Novell MHS users. Gateways to public e-mail like MCI are due later this year, as are versions for the Macintosh, VAX, UNIX, System 3270 VM and other platforms.

Office is indispensable for anyone who uses *WordPerfect*, *PlanPerfect*, or *DrawPerfect*. You can overcome *WordPerfect*'s limit of two editing windows by launching multiple *WordPerfects*, using the shell to switch and transfer text between them. Programmable macros automate complex tasks. You can, for example, instruct the shell to import a spreadsheet to *DrawPerfect*, graph the data,

import the graphic into a *WordPerfect* document, print it, and then transmit the file via electronic mail.

Office's desktop utilities and mail service features go deeper than its rivals. All *Office* programs operate in full-screen mode, but the calendar has pop-up alarms, multilevel priorities, and auto-date formulas. The LAN version's scheduler searches calendar files when organizing events on a network; the calendar and database can export merge files to *WordPerfect*.

Office can launch an application by clicking on the file, and then automatically tell the application to print the file and exit. *Office* recognizes current *WordPerfect* formats, but, unlike *Lotus Magellan*, won't try to recognize other formats unless you



Office's calendar program can set multiple priority levels.

match applications with extensions like .PCX or .DOC.

For *WordPerfect* veterans, *Office* will feel as comfortable as an old glove, and a lot more powerful. But those who don't remember that Ctrl-F3 is *WordPerfect*'s screen-control key, may never guess how to divide the File Manager's screen into a directory tree and a filelist. ■

List Price: *Office PC*, \$149

(upgrade from *Library*, \$49); *Office LAN*, 5-pack \$495, 20-pack, \$1,595. **Requires:** DOS 3.0 or later for file-locking feature; LAN version supports Novell, 3Com, Banyan, IBM, 10Net, TOPS and other networks. *WordPerfect Corp.*, 1555 N. Technology Way, Orem, UT 84057; (800) 451-5151, (801) 225-5000.

CIRCLE 800 ON READER SERVICE CARD

VersaColor LCD Offers 512 Colors

HANDS ON
by Alfred Poon

The \$4,799 Proxima Data Display VersaColor (Model A720C) can display output from CGA through VGA.

It stacks three double-twist LCD panels of red, yellow, and blue. Each has a proprietary 8-level gray-scaling technology. Combined, the panels can then display 8 by 8 by 8, or 512 colors. Proxima achieves an even level of contrast with its built-in microprocessor that maintains color balance.

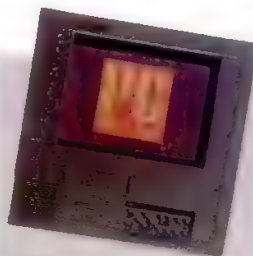
The problem with the sandwiched LCDs is the light lost when they transmit images to the screen. We used a light meter to measure the light hitting the projection screen. Then we measured with the panel removed. The panel soaked up 95 percent of the projected light.

The dim image puts the VersaColor into "the dancing dog" category. In vaudeville shows, you didn't expect a dog to dance well—it was sufficient if it

could dance at all. Similarly, the VersaColor displays many colors, but the end result still falls short of expectations.

You can control the relative brightness of the red and green components in the image—but only together—making it hard to adjust color combinations.

On the other hand, the 6:11 display contrast ratio compares



The VersaColor offers an unprecedented number of colors in its LCD display. Despite excellent contrast, images suffer from poor color definition and a loss of brightness.

favorably with the units tested last February (See "LCD Panels: 12 for the Road," February 27, 1990). A special text display button makes text look clear and crisp. The front panel also has controls for color, reversed color, and a sync control that reduces jitter. Position controls center the image.

The VersaColor comes with a variety of cables, a screen show utility, an infrared remote control, and software for both PCs and Macs.

Measuring 1.9 by 12.5 by 12 inches (HWD) and weighing 6 pounds, the major advantage it has over monitors and projectors is portability. The VersaColor demonstrates how far LCD technology has advanced, but you might want to wait before purchasing a full-color projection panel. ■

List Price: Proxima Data Display VersaColor, \$4,799. *Computer Accessories Corp.*, 6610 Nancy Ridge Dr., San Diego, CA 92121; (800) 582-2580, (800) 582-0852 (inside Calif.), (619) 457-5500.

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First Looks

Ergo Brick: A Tote-able that Outperforms the Desktops

HANDSON
by Matthew J. Ross

Recent product introductions from IBM and Tandy have rekindled interest in the home market. Another company looking to capitalize on this untapped market is Ergo Computing of Peabody, Massachusetts. Ergo is a start-up computer company; its Brick is a 16-MHz 386SX that's the size of a ream of copier paper. It's meant to be a one-PC solution between home and office.

Ergo's Brick maintains the functionality of a desktop PC within a small form-factor. It weighs just 8.06 pounds (plus a 2.4-pound external power supply) and measures 3.25 by 8 by 11.25 inches. The Brick comes with the same nonsense components found in the desktop PCs of serious power users, including 1MB of system RAM expandable to 8MB, Super VGA circuitry with 1MB of video memory, a 14-inch color VGA monitor, and a 2,400-bit-per-second internal modem by Silicon Systems. The unit and a 16-inch-long reduced footprint keyboard fits inside Ergo's \$99 cloth totebag. The standard disk configuration is a 40MB IDE drive from Conner Peripherals; other offerings include a 25-millisecond 100MB or 200MB (18 ms) Conner drive.

At first glance you might think the Brick is a conversation piece for the rich and trendy, but in fact the Brick is a real performer, consistently outperforming both Compaq's and IBM's 16-MHz SXs on the PC Labs computer benchmark tests. The video performance is excellent, thanks to the Chips and Technologies 452 chipset.

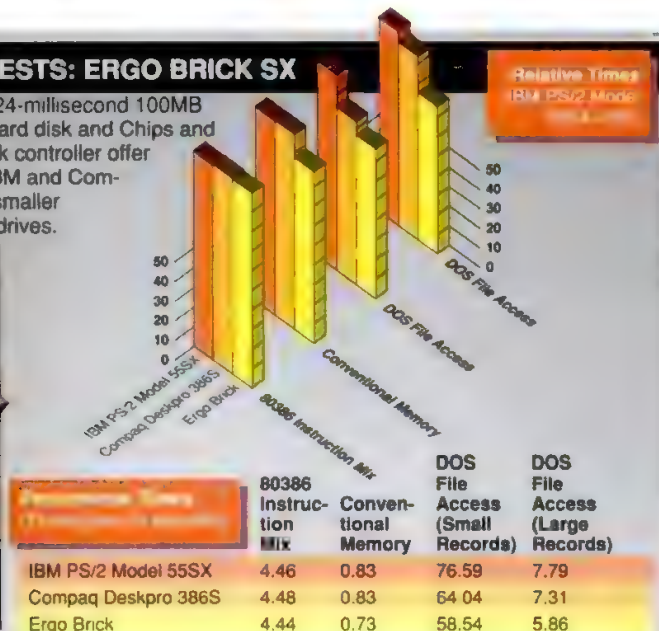
The distinctive aluminum case features rubber corners to protect it against shocks in



BENCHMARK TESTS: ERGO BRICK SX



The Ergo Brick SX's 24-millisecond 100MB Conner Peripherals hard disk and Chips and Technologies 602 disk controller offer superior performance over IBM and Compaq's slower-rated (28 ms), smaller (30MB and 40MB) standard drives.



transport. Across the back is a full complement of connectors including EGA and VGA, keyboard, one parallel and two serial ports, and an RJ-11 jack. To reduce noise, a thermostat-driven fan operates only when the internal temperature exceeds ambient room temperature by 30 degrees.

The case is also designed to cool the system. The system-board is upside-down at the top of the unit. A pouch filled with 3M Fluorinert, a liquid-thermal transfer material, is sandwiched between the case and system-board to diffuse the heat.

Options available later this year include a VGA liquid crystal display and a docking station. The \$895 LCD connects to any standard VGA connector and makes the Brick a true portable PC. The \$249 docking station provides a duplicate set of peripheral connectors. This allows you to connect and disconnect the Brick from all cables at once. The docking station uses a 180-pin connection hidden behind a sturdy hinged panel on the side of the Brick case.

Nothing exists without compromise: the Brick's size makes internal expansion nearly im-

possible. Components are so close to one another that opening the case is a nightmare. If you manage to get the unit open, fitting the disk drive cables back inside the box is maddening.

The Brick features a 16- and an 8-bit slot but accepts only half-length cards. The floppy drive position renders the 8-bit slot useless. The unit can be bought without a floppy drive, but since the floppy and hard drives are bolted together to add stability, the floppyless unit may compromise strength. Using the keyboard blocks access to the floppy drive, which is at the bottom of the case. The Brick needs to stand upright to get to the drive.

Miniaturization demands other compromises. To preserve space, vertically installed SIP (single in-line package) memory modules are used instead of the more common (diagonally positioned) SIMMs. SIPs must be soldered to the system board, making memory upgrades a job for dealers only.

One other problem involves the external power supply. Since a PC's disk drive typically requires more power (12V) than the internal circuitry (5V), the Brick's power supply needs

more connections than a standard three-pronged plug. The Brick uses a 9-pin connector joined to the unit with poorly designed spring clips that make the power cord easy to disconnect. Ergo is working to correct this problem.

No doubt, the Brick is an attention getter. Expansion is difficult, but for someone looking to get a single PC that bridges work and home, buying a Brick with two power supplies, monitors, and keyboards is a stylish and cost-effective alternative. ■

FACT FILE

Ergo Brick

Ergo Computing Inc., One Intercontinental Way, Peabody, MA 01960; (800) 633-1925, (508) 535-7510.

List Price: \$2,995 with 1MB RAM, 40MB hard disk, 3.5-inch floppy disk drive, VGA monitor, power supply, keyboard. Second VGA monitor, power supply, and keyboard, \$650.

In Short: Limited expansion is offset by portability and sleek styling in this unique, powerful SX. A viable alternative to buying one PC for work and another for home.

CIRCLE 437 ON READER SERVICE CARD

In Redondo Beach, California . . .

You'll find breathtaking ocean views, sensational surfers and Gateway 2000 computers.

Dive 'N Surf, famous for Body Glove® fashions and watersports equipment, is a



Graham Pask, Computer Systems Manager for Dive 'N Surf, and his Gateway 2000 25 MHz 386 network server.

member of the growing family of Gateway 2000 customers in California. Dive 'N Surf Computer Systems Manager Graham Pask chose a Gateway 25 MHz 386 machine for his network server. The system runs point-of-sale, inventory control, word processing and desktop publishing software.

"I decided to buy a Gateway 2000 system because they had everything I wanted for a good price," said Graham. "But what really impressed me was the service. I had a problem with my 3 1/2 inch drive so they sent me a new drive the very next day."

Graham said he was so happy with his Gateway system at work that he bought a Gateway 2000 25 MHz 386 Cache machine for his home.

Until well after sunset, surfers ride the big waves on the Pacific Ocean near Redondo Beach, California.



And In Barrow, Alaska . . .

Over 300 miles north of the Arctic Circle, you'll find polar bears, seals, whales, walrus, lemmings, snowy owls and what appear to be the largest mosquitoes in existence. On a summer afternoon you'll also see parka-clad tourists

walking among local residents in shorts. And of course you'll find a good Mexican restaurant and Gateway 2000 computers.

Cape Smythe Air Service, a regional commuter airline serving Barrow, Kotzebue, Nome and remote villages in Alaska, has one of several Gateway 2000 computers operating in Barrow. Jeff Frier, Cape Smythe's accountant, chose a Gateway 2000 386SX to

run spreadsheet, data base and accounting applications.

"I was trying to decide between Gateway 2000 and a competitor," Jeff commented, "so I talked to a person who owns the competitor's system. He was disgruntled about the service he received from them. Then I talked to another person in Barrow who has a Gateway and she was happy with the product and service. The choice was pretty obvious -- when you're doing business in a remote area, the most important things a vendor can offer are reliability and good service."

Jeff said he also appreciated Gateway's features and price. "When you have to pay \$6 a gallon for milk, it's nice to find a bargain somewhere." Jeff plans to buy another Gateway 2000 computer in a few months .



Jeff Frier, Cape Smythe Air Service, with his Gateway 2000 386SX.

On a mid-July day in Barrow, Alaska, fishing boats weave in and out of icebergs on the Chukchi Sea.



Near Camp Verde, Texas . . .

You'll find the magnificent Hill Country of Texas with rattlesnakes, prickly pear cactus and huge cattle ranches. You'll also find Larry Mahan and his Gateway 2000 computer.

Larry Mahan is to rodeo what Jack Nicklaus

is to golf. He is Six Times World Champion All-Around Cowboy and is a member of the Cowboy Hall of Fame. But Larry also runs a cattle and horse ranch and is involved in a western apparel manufacturing company and a new Southwestern foods company. His Gateway 2000 20 MHz 386 system is an integral part of his business operations. "We run cow and calf software for



Larry Mahan, rodeo star, and his Gateway 2000 20 MHz 386 system.

our Longhorn cattle herd," Larry said. "You can't really manage a livestock business efficiently without it. Plus we do accounting, spreadsheets and word processing on our Gateway 2000 computer."

Asked why he chose Gateway 2000, Larry said, "They had the best features and price – and I thought a computer company that puts pictures of cattle in their ads had to be my kind of people. And I was right. The people I've talked with at Gateway 2000 are honest-to-goodness nice folks. It's a pleasure doing business with them."

Larry Mahan raises registered Texas Longhorn cattle.



In Bradford, Pennsylvania . . .

You'll find a charming small city nestled in the Allegheny National Forest. The city's most prominent local business is the Zippo Manufacturing Company, where you'll find 18 Gateway 2000 computers in use.



Fred Gronemeyer, Zippo Manufacturing Company, and his Gateway 2000 20 MHz 386 system.

Zippo is known around the world for its windproof lighter made famous during the second World War, although today the company's product line includes many other specialty advertising items. Fred Gronemeyer, Systems Analyst for Zippo, chose Gateway 2000 as the company's standard PC.

"We needed to set standards for PC's and software to make the most efficient use of these tools," Fred remarked. "We started out with PC's from different manufacturers, but once I tried Gateway I was convinced we could get the highest quality, most reliable machines at the best price from Gateway 2000. I was also impressed by my salesman and the tech support people I've dealt with at Gateway."

Fred said by the end of the year Zippo will be running every system Gateway 2000 makes, from 286's up to a 486 and everything in between.

Main Street, U.S.A. is located in Bradford, Pennsylvania.



And In New York City . . .

You'll find your senses overwhelmed by the countless sights and sounds of this one-of-a-kind city. And of course you'll find thousands of Gateway 2000 computers here.

One New York City Gateway 2000 owner is



Jim Rondinelli, independent record producer and engineer, with his Gateway 2000 386SX.

independent record producer and engineer Jim Rondinelli. Jim uses his Gateway 2000 386SX with a sophisticated player piano sequencer to compose music.

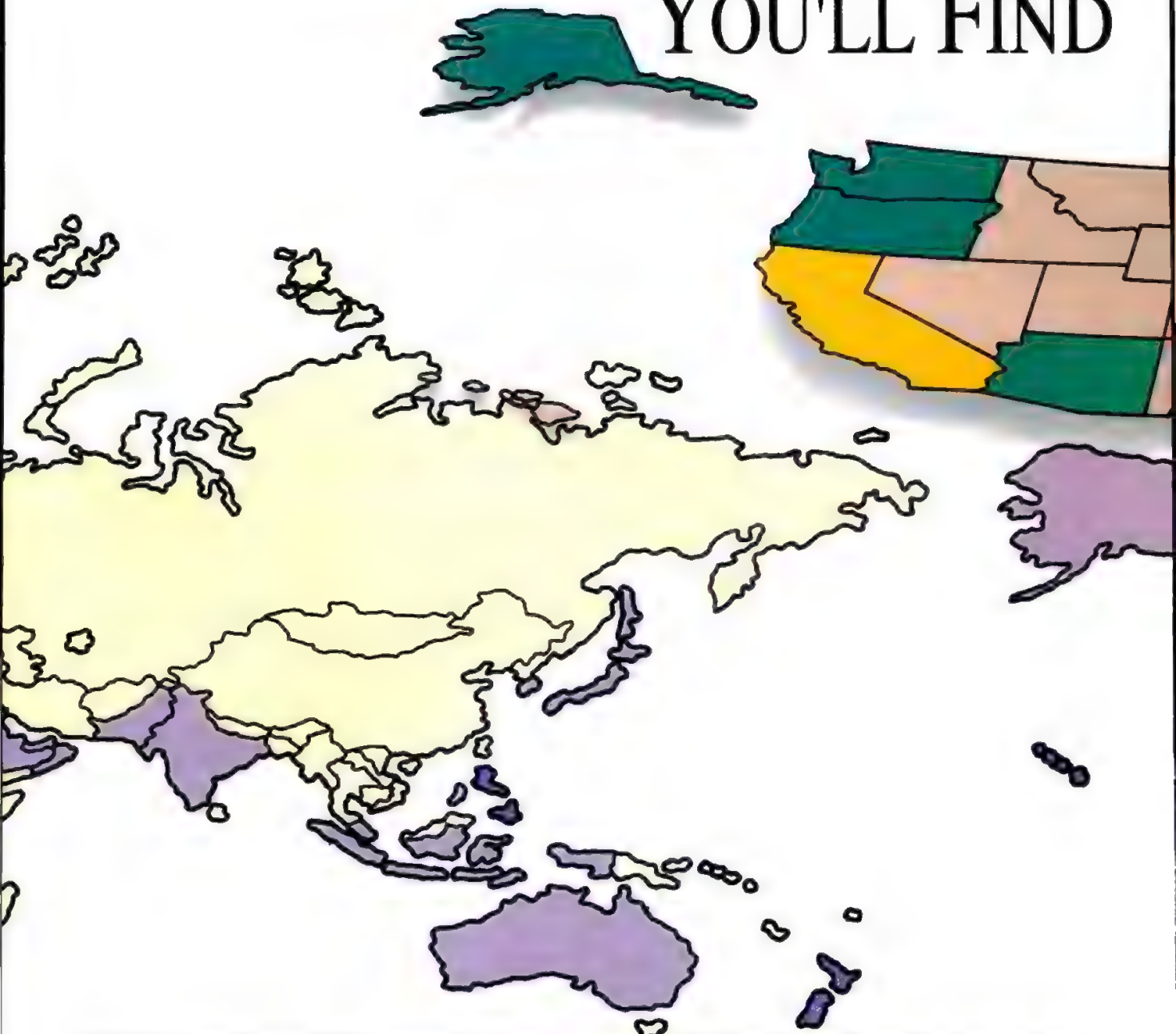
"The software I use is written for the Mac and for IBM compatibles," Jim said, "but it runs much better on IBM compatibles. And it runs best of all on my Gateway. I travel often and I've used my software on a lot of other machines. They don't even compare with my Gateway 2000."

Jim said he bought his Gateway 2000 because it was equipped for the real world with ample hard drive capacity and RAM, both sizes of disk drives and color VGA graphics.

"It's the fastest file transfer computer I've ever used," continued Jim, "plus it ran right out of the box. One afternoon and I was fully functional on a brand new system."

The streets of Manhattan are a constant blur of activity.

ACROSS THE COUNTRY YOU'LL FIND

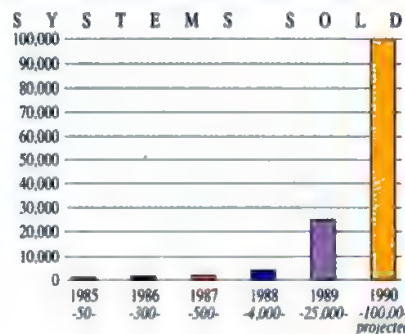


You'll find so many Gateway 2000 computers in so many places today because people everywhere know a good value when they see one. In all 50 states and in over 70 foreign countries, thousands of people are comparing prices, quality and service – and choosing Gateway 2000.

But value alone doesn't explain how a little company in the Midwest, started just five years ago, managed to outdistance hundreds of other companies, selling more systems through the direct market channel today than any other PC manufacturer in the country.

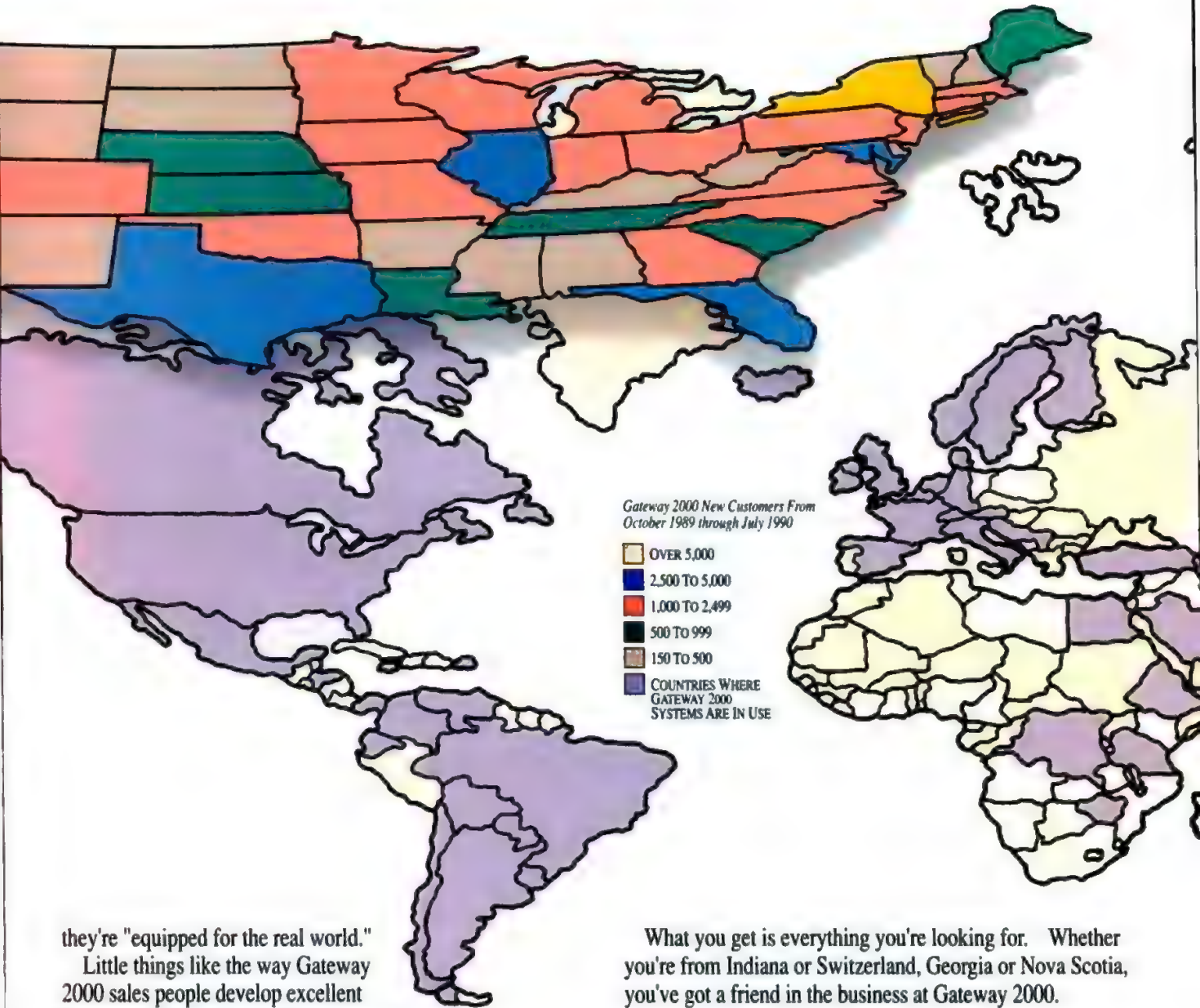
The explanation is that the company has always maintained a small company attitude. With Gateway 2000, you still get the little things you'd expect only from a small firm.

Little things like a positive technical support department. When Graham Pask told his Gateway 2000 tech rep that his 3 1/2" drive didn't work, he received a new drive the very next day.



Little things like the way Gateway 2000 systems are fully loaded with all the features you want. Jim Rondinelli bought a Gateway 2000 computer because

AND AROUND THE WORLD, GATEWAY 2000!



they're "equipped for the real world."

Little things like the way Gateway 2000 sales people develop excellent business relationships with their customers.

Fred Gronemeyer tried his first Gateway because he was impressed by his sales person. Eighteen systems later, Fred is still impressed by his sales person.

And the biggest little thing of all is the feeling you get when you deal with the people at Gateway 2000. As Larry Mahan said, "they're honest-to-goodness nice folks."

Compare prices, quality and service. Then add up the little things you get from small town people running an old-fashioned, high-tech business.

What you get is everything you're looking for. Whether you're from Indiana or Switzerland, Georgia or Nova Scotia, you've got a friend in the business at Gateway 2000.



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- 16 Bit VGA with 512K
- 14" 1024 x 768 Color Monitor
- 1 Parallel & 2 Serial Ports
- 101 Key Keyboard
- MS DOS 3.3 or 4.01

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GATEWAY 386SX

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- 1.44 Meg 3.5" Drive
- 40 Meg 17ms IDE Drive
- 16 Bit VGA with 512K
- 14" 1024 x 768 Color Monitor
- 1 Parallel & 2 Serial Ports
- 101 Key Keyboard
- MS DOS 3.3 or 4.01
- MS WINDOWS 3.0

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- 101 Key Keyboard
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- MS WINDOWS 3.0

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- 101 Key Keyboard
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- MS WINDOWS 3.0

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First Looks

2,400-BPS Acoustic Couplers Hit the Road

HANDS ON!
by David H. Rowman

Laptop computers are everywhere, but hotel rooms properly wired for telecommunications are less common. Two new acoustic couplers built for the road, the \$149.95 Telecoupler and the \$179 MA-100, let you communicate at up to 2,400 bits per second from many phones.

The couplers don't include modems, they fool your laptop's modem into thinking it's hooked directly to a phone line. The units fit neatly inside most laptop bags. Unfortunately, neither work reliably at 2,400 bps, and only the Telecoupler features direct modem dialing. With the MA-100 you must dial the phone manually, then issue a Hayes ATD dial command to your modem.

The more traditional-looking Telecoupler has familiar

rubber cups to cradle a phone receiver. A Velcro strap attaches the Telecoupler to odd handsets, and the cups swivel to accommodate most phones. Weighing 9.1 ounces, the Telecoupler comes with a little pouch, is six inches long, and looks like an anorexic telephone handset. You don't need AC power since the Telecoupler is rated to run 7 to 13 hours on four AAA cells.

Your modem's phone cable plugs into the unit's RJ-11 jack, and the rubber cups physically connect to the phone's ear and mouth pieces. You use your modem normally, except you must dial manually with some pulse lines.

The MA-100's design is inventive. The unit looks like a slim cigarette pack that telescopes out to accommodate the length of your phone. The MA-100 attaches to the phone via

two thin straps that bend to assure the snugest fit. Unfortunately, when used on a cheap one-piece phone, the MA-100 had trouble fitting securely without hanging up the phone.

Like the Telecoupler, the MA-100 also offers an RJ-11-style interface, but the battery life is longer: according to the manufacturer, 80 hours of connect time on a six-volt J cell. Neither the MA-100 nor the Telecoupler supports modems that can draw power only from the phone lines. (After all, there is no electrical connection with the lines.)

The Telecoupler proved more reliable under informal testing with a Zoom modem, MagicSoft's MTEZ communications software, and a standard Bell-style telephone. We were able to log onto MCI Mail and CompuServe at 1,200 bps. When the less-expensive, one-piece telephone was substituted, performance at 1,200 bps was unreliable.

The MA-100's performance was fine at 1,200 bps with the standard phone, but also unreliable when used with the one-

Acoustic couplers connect laptop modems to almost any phone.

piece phone. At 2,400 bps, both couplers suffered regardless of the phone used; both require error-correcting communication software.

List Price: The Telecoupler, \$149.95. Computer Products Plus Inc., 16351 Gothard St., Huntington Beach, CA 92647; (800) 274-4277.

CIRCLE 434 ON READER SERVICE CARD

List Price: MA-100, \$179 (2,400 bps), \$129 (1,200-bps). Information Machines, 20219 Chapter Dr., Woodland Hills, CA 91364; (818) 884-5779.

CIRCLE 435 ON READER SERVICE CARD

Powerpak's Scalable Fonts For Windows: Low Cost, Mixed Blessings

HANDS ON!
by James S. Brown

For \$79.95, the latest version of Atech Software's *Publisher's Powerpak* brings hassle-free installation of scalable typefaces to any Windows application. *Powerpak* uses a virtual printer scheme to trick Windows into using its proprietary fonts. You designate *Powerpak* as your default output device and the resulting print setup screen contains *Powerpak*-specific options, as well as common printer parameters.

You can select paper size, page orientation, and resolution, but you can also designate the physical printer to which output is redirected, install new fonts, and create bitmapped

screen equivalents.

Powerpak's advantage? Typefaces which can be interactively scaled from 4 to 127 points are available to a host of printers—including 300-dpi lasers and 72-dpi dot matrix printers. However, those who are finicky about quality may be disappointed with Atech's proprietary type outlines.

The program comes with Dixon, Marin, and Cobb type formats that roughly correspond to the Apple LaserWriter's Helvetica, Times, and Courier. Atech uses one outline to generate each of 10 font variations, such as expanded or condensed. That outline produces 4 different styles, such as bold or italic. The results are predictable. Expanded, boldfaced fonts show distortions at large point sizes. For a bit more you can solve this. *Powerpak*-compatible samplers of true Monotype typefaces are \$79.95 each.

Aesthetics aside, *Powerpak* is convenient. Instead of struggling with long lists of available

fonts stored on your hard disk, you can create and name grouped sets of fonts. You can print to a file—a feature which some Windows applications forgot. The compatibility mode that forces linebreaks on a print-out is a good copy-fitting tool if you plan to proof on a low-resolution dot matrix printer but generate final output on a laser printer. Unfortunately, since *Powerpak* doesn't support PostScript in any form, the only way you can get your copy to a high-resolution device is via a separate program—Atech *Typesetters Utility*.

Windows 3.0 users can create the screen fonts on the fly. For reasonably sized type—up to 32 points—*Powerpak* generates good-looking screen equivalents. At large point sizes the screen fonts show approximate word spacing and leading only.

Powerpak's ancillary screen driver recognizes only vanilla EGA and VGA screen drivers. I first installed the program with an extended VGA card but then

Powerpak could not generate screen fonts on the fly, nor could it accurately position the bitmapped screen fonts.

Even though *Powerpak* generates fonts as it sends a file to the printer, performance times for moderately formatted, text-only pages were very acceptable—about twice as slow as an HP LaserJet II equipped with cartridge fonts. Performance deteriorated when graphics were brought into a document.

If quality is paramount, you should invest in PostScript-compatible fonts. But, if you are bargain hunting, or don't own a 300-dpi laser printer, *Publisher's Powerpak* provides type technology that is—simply stated—good enough.

List Price: *Publisher's Powerpak* (Microsoft Windows Edition) \$79.95. **Requires:** 512K RAM, DOS 2.0 or later, Windows 2.0 or later, 600K of hard disk space. Atech Software, 5964 La Place Ct., Carlsbad, CA 92008; (800) 748-5657.

CIRCLE 433 ON READER SERVICE CARD

The Product Is Great, The Price



STANDARD SYSTEM 286/12 \$595

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- SUPPORTS 80287 CO-PROCESSOR AT 10MHz OR 12MHz
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- SYSTEM BOARD MADE IN U.S.A.
- 16½" W x 6" H x 16¾" D

SPECIAL FEATURE: THIS SYSTEM CAN BE UPGRADED TO A 386/SX USING CPU MODULE



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"It seems able to do what other SX machines do, only better and faster"—August 1989

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*Prices listed are available with complete system purchase only.

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- 2 SERIAL PORTS, 1 PARALLEL PORT AND 1 GAME PORT
- 8 EXPANSION SLOTS
- KEYBOARD SELECTABLE CPU SPEED
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STANDARD SYSTEM 386/33 \$2,195

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- 384K SHADOW RAM
- 1:1 INTERLEAVE FLOPPY/HARD DISK CONTROLLER
- 1.2MB OR 1.44MB FLOPPY DRIVE
- 101-KEY TACTILE FEEDBACK KEYBOARD
- 2 SERIAL PORTS, 1 PARALLEL PORT AND 1 GAME PORT
- 8 EXPANSION SLOTS
- KEYBOARD SELECTABLE CPU SPEED
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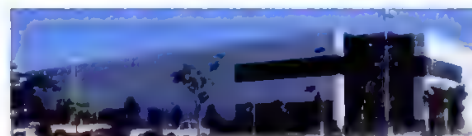
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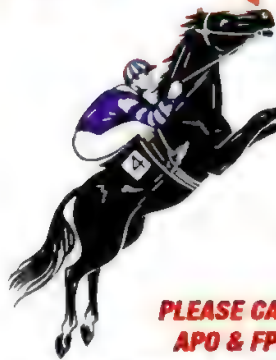
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DB Fast/DOS Plus	179.00	ATI VGA Wonder 512 W/ Mouse	349.00
Foobase Plus	199.00	Copy II Option Board Deluxe	115.00
Foxpro Lan	679.00	Logitech Bus Mouse CB or Serial	85.00
Foxpro Single User	479.00	Logitech Scan Man Plus	185.00
Paradox V 3.0	489.00	Logitech Trackman Serial or Bus	89.00
PC File 5.0	75.00	Masterpiece Plus	105.00
R & R Relational Report Writer	105.00	Microsoft Mouse w/Windows 3.0	159.00
DESKTOP PUBLISHING		Microsoft PC Trac Serial	75.00
Breastream Fonts (each)	95.00	MS Mouse w/Point Serial Or Bus	109.00
Freedom of Press	259.00	Pacific Data 1-2-4 Board w/1MB	179.00
Go Script Plus Ver 3	195.00	Pacific Data 1-2-4 Board w/2MB	249.00
Go Script Ver 3	99.00	Pacific Data PacificPage for IP/W	379.00
PFS 1st Publisher 3.0	95.00	Pacific Data 25-in-one	289.00
The New Print Shop	39.00	Pacific Data PacificPage	479.00
UltraScript PC Plus 2.0	269.00	Postscript Cartridge by Adobe	282.00
Ventura Publisher Gold	579.00	Prac Periph 2400 Ext w/MNP	209.00
EDUCATION & ENTERTAINMENT		Prac Periph 2400 Int w/MNP	175.00
Flight Simulator 4.0	45.00	Sota 386 Accelerator	305.00
Leisure Suit Larry III	39.00	Sota 386 Accelerator	409.00
Microsoft Learning DOS	35.00	Super Cartridge 1-1Q Engineering	275.00
PC Globe 3.0	39.00	Super Cartridge 2-1Q Engineering	449.00
Playroom	32.00	Worldport 2400 Modem w/ MNP	345.00
Smicity	33.00	Worldport 2496 Fax Modem	485.00
Tetris	22.00	INFORMATION MANAGEMENT	
Typing Tutor IV Plus	35.00	Agenda	275.00



Postscript Cartridge by Adobe. The only true Postscript Cartridge is now available from Adobe for the HP Laserjet II. It contains the 35 typefaces found in most Postscript printers with additional typefaces from Adobe. It also contains a font foundry for creating fonts. Requires only 1.5MB on the printer and has been tested at 1.5-2.5 times faster than other similar cartridges. AT \$495 list and ONLY \$282. from Compuclassics the Postscript Cartridge by Adobe is the Price/Performance leader in its category. Postscript Cartridge by Adobe \$282.00

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SPSS/PC Plus	549.00	WINDOWS	
Statgraphics	579.00	Adobe Illustrator Windows	295.00
Systat w/ Graphics	879.00	Adobe Streamline	235.00
SPREADSHEET		Admi Professional	309.00
Allways (Lotus 1-2-3 or Symphony)	115.00	Corel Draw Windows 1.2	329.00
Lotus 1-2-3 Ver 2.2	349.00	Crosslink For Windows	125.00
Lotus 1-2-3 Ver 3.0	419.00	Dragnet 1.0	89.00
Quattro Pro	319.00	DB Fast/Windows	209.00
Quattro Pro Upgrade	99.00	Excel	319.00
Sideways 3.2	42.00	hDC Windows Express 3.0	82.00
Supercalc V	319.00	IBM Current	239.00
The Baler	359.00	Micrografix Designer 3.01	489.00
VP Planner Plus 30	155.00	Micrografix Graph Plus	355.00
UTILITIES		Microsoft Project for Windows	475.00
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Brooklyn Bridge 3.0	79.00	Prompt 1.0	79.00
Check It	65.00	Soft Type (2 Soft)	119.00
Copy II PC 5.0	25.00	Superbase 4 for Windows	429.00
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Mace Utilities 1990	89.00	Grammatik IV	48.00
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Norton Commander 3.0	99.00	Rightwriter	52.00
Norton Utilities Advanced 4.5	85.00	Word 5.0	219.00
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Software Carousel	55.00	SCO Unix Dev System 386	855.00
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PC-Kwik Powerpak	79.00	SCO Xenix Operating System 386	479.00
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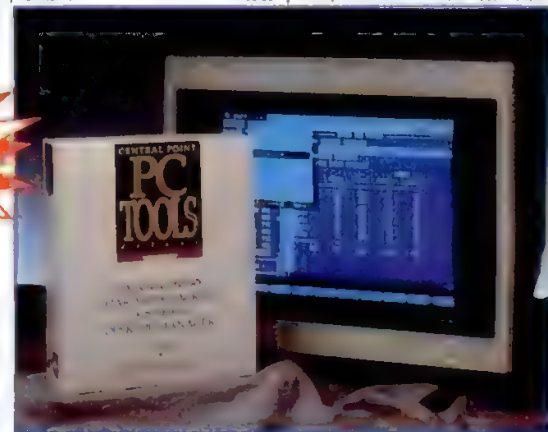
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PC Tools Ver. 6.0 is the last utility anyone will need. It contains the most powerful collection of DOS utilities including a comprehensive DOS Shell, Data Recovery including undelete, unformat and diskfix, A Hard Disk Backup utility with tape drive support and other features. It also contains a desktop manager with a full database, telecommunications for E-Mail, Notepads, Schedulers and a Macro Editor as well as a memory caching system, file compression and PC Secure to password protect sensitive data. With modes for beginner, intermediate and advanced users it is the ultimate utility for all PC users. \$80

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CIRCLE 205 ON READER SERVICE CARD

by
Rink Murray

New & Improved

News of Announced Products and Upgrades

LaserBoard 6: Multiuser Support for HP Lasers

NEW

LaserBoard 6, from Digital Products, lets up to six PCs share HP LaserJet Series III, II, and IID printers. LaserBoard installs in the optional I/O slot in back of the printer, and users connect to the board via RJ-11/12 connectors and 4-wire telephone cabling. The LaserBoard lets users share a printer and print concurrently with its Start of Job and End of Job commands and user-definable timeouts. LaserBoard's 256K dynamically allocated buffer—upgradeable to 1 MB—stores data when the printer is busy and frees the user's PC while waiting to print.

Digital also announces Distance Extender, a network product that extends the distance that the server can access a parallel printer. By installing a transmitter on the parallel port of the server and receiver of the printer, users can increase the distance between them from 15 to 4,000 feet. Each unit uses two pair telephone type cabling (purchased separately).

List Price: LaserBoard 6, \$495. **Requires:** Hewlett-Packard LaserJet Series II, IID, and III printers. Distance Extenders, \$190. Digital Products Inc., 108 Water St., Watertown, MA 02172; (800) 243-2333 or (617) 924-1680.

CIRCLE 448 ON READER SERVICE CARD

TURBOCable Speeds Long-Distance File

NEW

With transfer rates up to 115K bits per second at distances up to 750 feet, TURBOCable from Western Telematics Inc., blows away the 10-foot limit encountered by file-sharing programs such as *LapLink*, *DeskLink*, *HOT WIRE*, *Brooklyn Bridge*, and *FASTLYNX*. This eliminates the need to place one PC next to another one in order to share files. The TURBOCable package comes with two serial port drivers, power adapter, and a 100-foot telephone-style cable. Longer cables are available from Western Telematic.

List Price: TURBOCable, \$149. Western Telematics Inc., 5 Sterling, Irvine, CA; (800) 854-7226 or (714) 586-9950.

CIRCLE 440 ON READER SERVICE CARD



The Smart One Traveler modem has send-only fax abilities.

Smart One Traveler Low-Cost Pocket Fax/Modem Weighs 8 Oz

NEW

Best Data Products has begun shipping the Smart One Traveler, a pocket-sized, battery-powered modem with fax capabilities. Weighing 8 oz., the 1.25- by 2.75- by 5-inch (HWD) Traveler features LED lights, speaker, a power-down feature, a 9-volt battery, an external AC adapter, and includes fax and communica-

tions software. Working as a modem, the Traveler operates at 2,400 bps with Auto Fall-Back, Auto Answer, Auto Dial, and Call Progress Monitoring. As a fax machine, the Traveler's software converts ASCII text, .PCX, TIFF, and IGM-GEM files into Group III files, transmits in background mode at speeds up to 4,800 bps, and can send multiple faxes to

CONTINUES ON PAGE 54

HOT PROSPECT

QMS PS-410: Supports Many Printer Emulations Automatically QMS has developed a laser printer to support the many printer emulations used in offices today. The \$2,795 QMS PS-410 includes: 45 resident Adobe Type 1 scalable fonts, 2MB RAM, a PostScript interpreter, PCL IV emulation, and AppleTalk. Yet the most promising features are the Emulation Sensing Processor (ESP) technology and the Simultaneous Interfacing ability. ESP eliminates the need to flip switches manually or load drivers whenever users switch between different printer emulations. The printer senses the change and automatically converts to the appropriate printer language mode. Simultaneous interfacing allows the printer to be accessed concurrently through its AppleTalk, serial, and parallel interfaces. To avoid printer overloads, each interface has a user-configurable buffer. The QMS PS-410 is a 4-ppm laser with a 16-MHz 68020 coprocessor. It also features the *Adobe Type Manager* font scaling algorithm within its controller.

List Price: QMS PS-410, \$2,795. QMS Inc., One Magnum Pass, P.O. Box 81250, Mobile, AL 36689; (800) 523-2696, (205) 633-4300.



CIRCLE 438 ON READER SERVICE CARD

New&Improved

SMART ONE

CONTINUED FROM PAGE 53

multiple destinations. The Traveler also has Time Scheduled Transmission, allowing users to transmit when phone rates are the lowest. The Traveler connects directly to your computer's serial port via an RS-232 pin adapter, and supports the Hayes command set.

List Price: Smart One Traveler, \$299. Best Data Products Inc., 9304 Deering Ave., Chatsworth, CA 91311; (818) 773-9600.

CIRCLE 441 ON READER SERVICE CARD

Third-Party Font Cards for IBM LaserPrinter 4019

NEW

Intercon Associates has announced four font card options to support the IBM 4019 LaserPrinter series: PRO Image, BOLD Image, LEGAL Image, and Bar None. The PRO Image has Helvetica, Times Roman, Prestige Elite, Line Printer, Letter Gothic, and Courier fonts, while BOLD Image offers large-point sizes for Helvetica, Times Roman, and Presentation

fonts. LEGAL Image contains both the Roman-8 and Legal character sets, and the Prestige Elite font. Bar None features Letter Gothic and is intended for printing UPS and bar codes. All four cartridges work in the IBM LaserPrinter's native mode. For users with more specialized needs, Intercon will customize these font cards to include logos and signatures.

List Price: PRO Image, \$369; BOLD Image, \$369; Bar None, \$279; LEGAL Image, \$205. Intercon Associates Inc., Four Cambridge Pl., 1870 Winton Rd. S., P.O. Box 18099, Rochester, NY 14618; (800) 422-3880, (716) 244-1250.

CIRCLE 442 ON READER SERVICE CARD

IMPROVED

DeScribe, Version 1.1—The OS/2-based *DeScribe* adds support for Dynamic Data Exchange (DDE) to let users hotlink to programs like *Lotus 1-2-3/G* and *Microsoft Excel*. Other new features in Version 1.1 include indexes, a table of contents, a Tab ruler, transparent objects, hollow text, superscripts and subscripts, new drawing tools and color, zoom, protected text and password protection, import/export capabilities for text- and graphics-based documents, plus a filter for the PM version of *Aldus PageMaker*. Version 1.1 retails for \$595, but Version 1.0 users can upgrade for free. Contact DeScribe Inc. in Sacramento, Calif., at (916) 646-1111.

PC-Write Lite, Version 1.02—In the Glasnost spirit, Quicksoft has upgraded the trim version of its shareware word processor to include support for the Cyrillic character set. In addition to distinguishing upper and lower case characters, Version 1.02 can display foreign character sets on-screen, and includes a Caps Lock Remap which allows any key to have a different value whenever the user engages the Caps Lock key. Complementing Version 1.02, Quicksoft has announced a Russian spell-checker that works in conjunction with the English spell-checker. *PC-Write Lite*, Version 1.02, costs \$64 for new users, and \$49 for registered users. The Russian spell-checker lists for \$29. Contact Quicksoft Inc. in Seattle, Wash., at (800) 888-8088 or (206) 282-0452.

EXP: The Scientific Word Processor, Version 2.0—Brooks/Cole Publishing Co.'s scientific WYSIWYG word processor lets users display multiple text fonts, technical characters, formulas, and graphics on a single editing screen. Version 2.0 allows users to import .PCX and TIFF graphics and provides a 100,000 word spell-checker. Other features in Version 2.0 include 450 technical and foreign language characters, graphics importation, preprogrammed macros, a macro editor, and e-mail compatibility. Version 2.0 can automatically size, center, and space mathematical expressions, as well as automatically italicize variables. Users can view four files on-screen and edit ten files at once. *EXP* retails for \$295, upgrades \$150. Contact Brooks/Cole Publishing Co., a Division of Wadsworth Inc., in Belmont, Calif., at (415) 595-2350.

LAWN—O'Neill Communications unleashes its second-generation LAWN

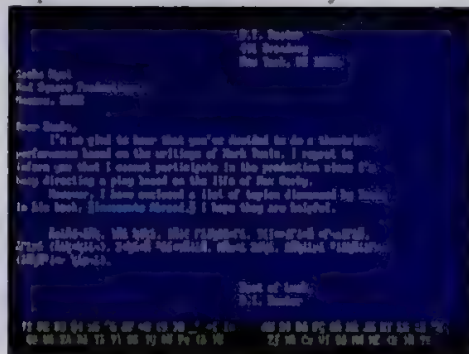
(Local Area Wireless Network). Running at speeds up to 19,200 bits per second, LAWN more than doubles its previous throughput. LAWN also offers a direct connect mode which lets users create direct serial links between their computers. Other enhancements include: an improved user interface; increased compatibility with third-party software; expanded e-mail features; COM3 and COM4 compatibility; and the ability to send files from the DOS command line. LAWN connects directly into any serial port and retails for \$298 per unit. Contact O'Neill Communications in Princeton, N.J., at (800) 624-5296 or (609) 924-1095.

Clarion Professional Developer, Version 2.1—Clarion Professional Developer now includes the Clarion Report Writer, a menu-driven full-featured report and query generator which combines Clarion, dBASE, and ASCII files into a single report. Version 2.1 includes a customized version of Pocket Soft's .RTLink to allow developers to create .EXE programs which won't require expensive runtime systems or LAN packs. .RTLinks supplies a runtime library that allows multiple .EXE files to share common code. *Developer's Designer* module features conditional source code which reduces program development time by generating source code only for modules that have changed. Applications developed with Version 2.1 will support extended and expanded memory. This memory must be assigned to a RAM drive which can be used as virtual memory to store memory tables, disk buffers, and disk caches. Virtual memory can also be configured to spill over onto the hard disk,

eliminating possible out-of-memory errors. Suggested list price for the *Clarion Professional Developer*, Version 2.1, is \$845. Contact Clarion Software Corp. in Pompano Beach, Fla., at (800) 354-5444 or (305) 785-4555.

MIRROR III, Version 2.0—*MIRROR III*, SoftKlone's communications program, has added mouse support, a historical function, on-line menus, and an improved dialing directory. Functions added to the dialing directory include: hotkey shortcuts, answer mode, copy, rename, print, edit, and erase. Additionally, each directory entry includes the port setting and a default protocol setting. To supplement *MIRROR*'s status screen and command line interface, the program now can display a single menu containing the most frequently used commands, and the program remembers the

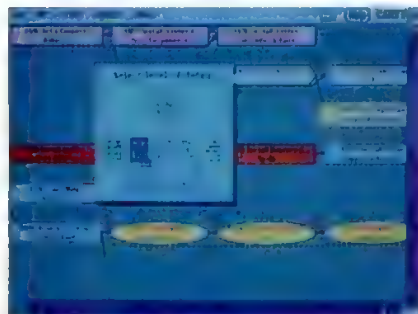
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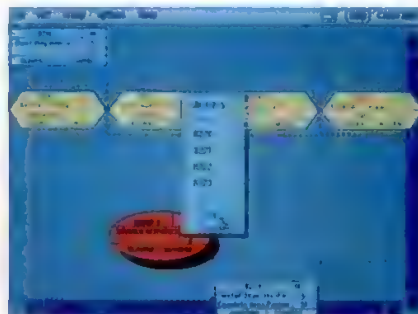
Operating in two keyboard modes, *PC-Write Lite*, Version 1.02, lets you type in English and Cyrillic. If you type in the wrong mode, instead of making you retype everything, Version 1.02 can convert it for you. The menu at the bottom of the screen tells you which keys correspond to which Cyrillic characters.

Primavera introduces some important new project management terminology.

Click-Click — use double clicks to add activities, define relationships, and modify activity data.



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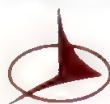
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Computers, FCC Class A, Class B, and You — or When is it better to get a B than an A?

You need to know the difference between computers that meet the FCC class B radio frequency emissions standards and those that meet only the Class A standards.

Computers emit radio signals in their operation. Because these signals may cause interference to radio and television reception, the marketing and the use of computers is regulated by the Federal Communications Commission. Under federal rules, computer users are responsible for remedying interference, including interference in neighboring homes.

Computers certified by the FCC as meeting the Class B standard are less likely to cause interference to radio and TV reception than those that have been verified by the manufacturer or importer to the Class A standards. Only Class B certified computers may be advertised, sold, or leased for use in residences. A similar regulatory program applies in Canada.

Buyers seeking computers for use in homes (including offices at home) should shop for computers and peripherals which have been Class B certified. These devices carry a label with an FCC ID number. Both new and used Class A verified devices may be sold only for use in commercial and industrial locations. Signals from computers are more likely to be masked by electrical noise from other equipment in such an environment. These areas are also likely to have fewer radios and TVs. Accordingly, equipment marketed only for use in these locations may meet the less rigorous Class A standard. Class B certified equipment may be marketed for use in residences as well as commercial and industrial locations.

As you shop for a computer for use in your home, look for the FCC classification in the specifications or ask your vendor to recommend only machines that have been certified to the Class B limits. TV viewers and radio listeners in your home and in neighboring homes will be glad you did.

New&Improved

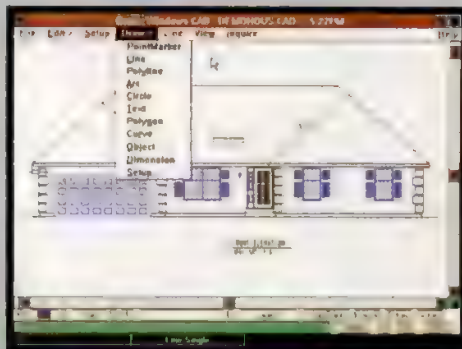
IMPROVED

CONTINUED FROM PAGE 54

commands as you execute them from the command line. Other new features include: data compression and verification for MNP Level 5 protocol; a script debugger utility; and a command that allows you to specify a standard DOS device name in place of a filename. *MIRROR III* retails for \$149. Contact SoftKlone in Tallahassee, Fla., at (904) 878-8564.

Advanced Revelation, Version 2.0—Revelation Technologies' proprietary relational DBMS language now incorporates Environmental Bonding, allowing users to create applications independent of a specific data format. By allowing users to read/write directly to a data format, Environmental Bonding eliminates the need to import/export data. Version 2.0 supplies "bonds" to *dBASE* and ASCII. Third-party developers have created bonds to *Lotus 1-2-3* and *AutoCAD*. And with the optional Environmental Bonding Toolkit, developers can create bonds to any other data format. This means that users can manipulate data interactively and concurrently with other DBMSs and can incorporate that data directly into applications. Even the Active Data Dictionary implements Environmental Bonding, letting users access any format in conjunction with the central dictionary. To enhance portability between hardware platforms, Version 2.0 provides dialect-independent ANSI SQL compatibility. The SQL Assistant provides context-sensitive help, and it lets the SQL command set act against any file accessible from *Advanced Revelation*. Version 2.0 retails for \$995, and registered users can upgrade for \$150 plus \$25 for shipping and handling. Contact Revelation Technologies in New York, N.Y., at (800) 262-4747 or (212) 689-1000.

Drafix Windows CAD, Version 1.1—Foresight Resources Corp.'s latest version of *Drafix Windows CAD*, Version 1.1, takes advantage of *Windows 3.0* functionality. New editing tools bypass the menu structures and allow users to copy, move, rotate, or stretch entities, and to add vertices interactively with just a click of the mouse. Since Version 1.1 utilizes *Windows*' advanced memory management capabilities, users can create larger drawings and, according to Foresight, experience faster performance. Version 1.1 has expanded database capabilities, which allows users to assign calculated fields to an entity or group of entities on a drawing, and to display the fields on-screen. Other features in Version 1.1 include: Background Redraw; IGES export; HPGL import; and improved printing speed. *Drafix Windows CAD*, Version 1.1, retails for \$695, and registered users can upgrade for \$20 (the cost of shipping and handling). Contact Foresight Resources Corp. in Kansas City, Mo., at (800) 231-8574 or (816) 891-1040.



Drafix Windows CAD is the first CAD package to take advantage of the *Windows 3.0* environment. Utilizing the memory management capabilities of *Windows 3.0*, *Drafix* users can create bigger drawings, and redraw in the background while continuing their work uninterrupted.

SpinRite II, Version 1.1—Gibson Research Corp. announces that the latest version of its hard disk diagnostic utility can diagnose "anything that spins," including ESDI, SCSI, and IDE drives, as well as Plus Hardcards. The previous version of *SpinRite* could only diagnose RLL and MFM drives, but it could also evaluate the interleave factor, and implement a nondestructive low-level format on those drives. With Version 1.1, *SpinRite* can now diagnose but not evaluate the interleave factor or perform a low-level format on IDE, SCSI, or any drive that incorporates sector-translating controllers. Version 1.1 does have increased tolerance for unreliable drives, so it will diagnose drives even when they barely function. Version 1.1 also includes an improved hypertext information system, and a Scrub-Brush icon to indicate that the system is working during lengthy operations. *SpinRite II*, Version 1.1, retails for \$89. Upgrades are free to registered users. Contact Gibson Research Corp. in Laguna Hills, Calif., at (714) 830-2200.

LET'S GET RIGHT TO THE POINT.

The point is: today's applications require a great pointing device. PC-TRAC™, our newest advanced-design trackball, gives you precision control over every move your cursor makes. Without cramping your desk, your style or your hand.

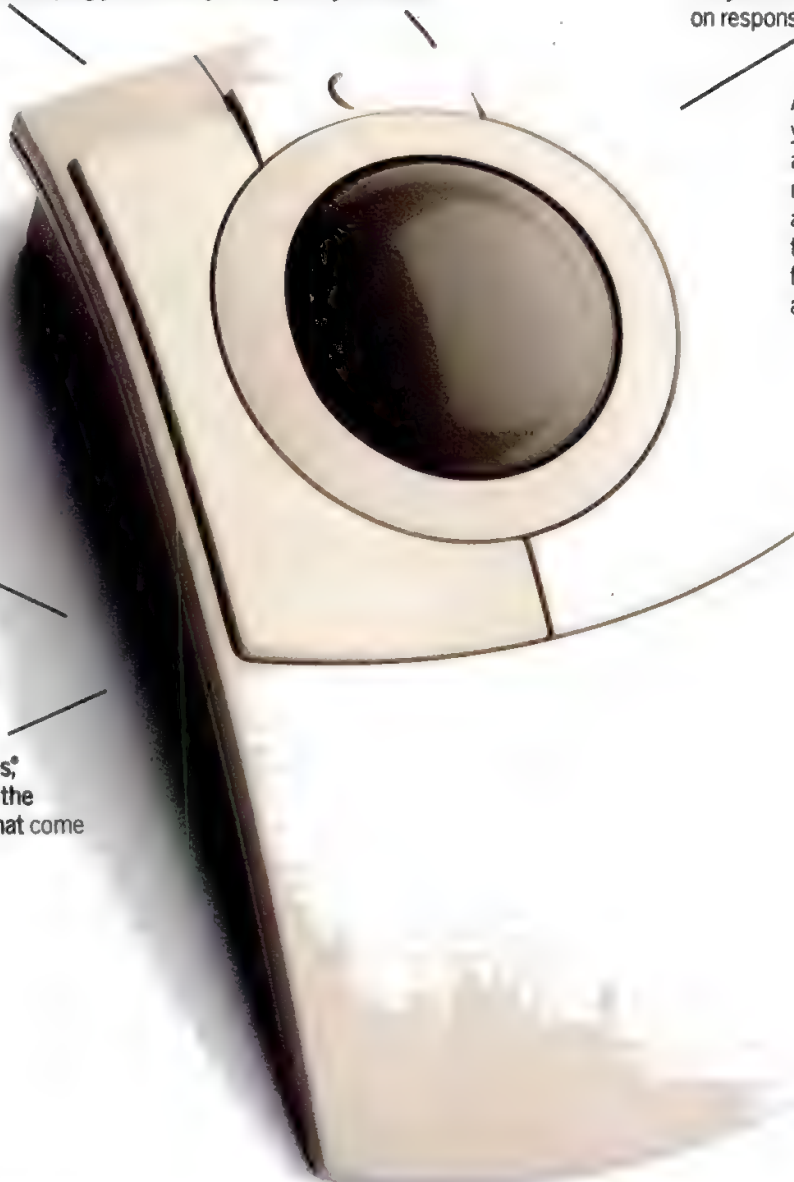
PC-TRAC is the most comfortable pointing device you'll ever lay a hand on. Relax your entire hand, while your fingertips master the power of touch with incredible ease. Control the ball and buttons with your fingertips. If mice ever made you feel like you're all thumbs, wait till you try PC-TRAC.

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PC-TRAC. A great pointer. Check it out for performance, style and an unbeatable price.

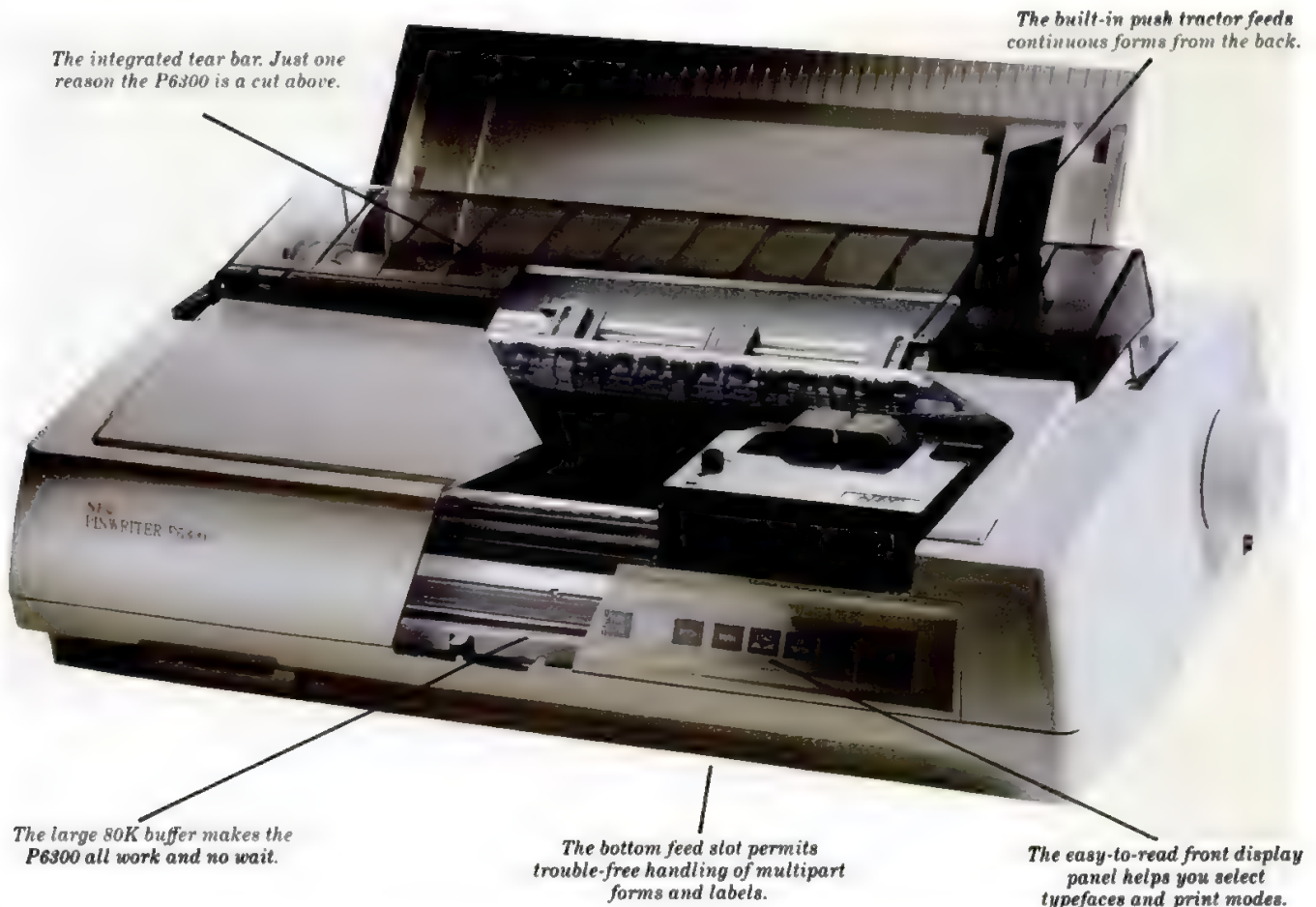
PC-TRAC available in Serial, Bus, PS/2 and InPort™ versions. Suggested Retail Price \$119, bus version slightly higher.

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CIRCLE 394 ON READER SERVICE CARD

Only the new NEC P6300 has the guts to outperform any dot-matrix printer in its class.



The integrated tear bar. Just one reason the P6300 is a cut above.

The built-in push tractor feeds continuous forms from the back.

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Only the Pinwriter® P6300 printer from NEC has the guts to deliver this much glory:

Bold, black print quality that makes a statement with every line. Color graphics* that turn not only heads, but opinion. Eight standard fonts that let you do more, more impressively. And a Quick Gothic™ font that gives you letter-quality output up to two-thirds faster than anything in its class. But

the beauty of the P6300 (and its narrow-carriage brother, the P6200) extends beyond the printed page. Because they give you the ability to print on everything from 24-pound letter-head and envelopes, to continuous forms, labels, and card stock. Plus the ease to go from one to another, from one minute to the next.

It takes guts to say the Pinwriter P6300 is the best dot-matrix printer you can buy today.

It takes a lot less than you think to bask in its glory.

NEC

*Color kit sold separately.

New&Improved

CONTINUED FROM PAGE 56

Diamond Carat 050: Full-Function Accounting in Plain English

NEW

Diamond Carat 050 from Diamond Data Management, is an accounting package designed for entrepreneurs and small businesses whose accounting lingo isn't polished. *Diamond Carat 050* is a fully functional accounting package but displays all prompts and menus in plain English, so that computer and accounting novices can master day-to-day functions with little training. The package includes integrated cash management, sales and receivables, purchases and payables, after-the-fact payroll, general ledger, and financial reporting functions.

List Price: *Diamond Carat 050*, \$995.
Diamond Data Management Inc., 740 N. Pilgrim Pkwy., Elm Grove, WI 53122; (414) 786-9000.

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Drawing Manager Tracks Network AutoCAD Files

NEW

Synergis Network's *Drawing Manager* acts like a librarian keeping track of all your AutoCAD files as they move across the network. *Drawing Manager* ensures drawing integrity by allowing only one user at a time to work on the master file. However, the program does allow users to copy drawings and save them under different names. *Drawing Manager* works on a Sign Out/Sign In basis, which locks the master file when another user has checked it out. You can also Move drawings from one part of the library to another, Edit files, and Print. The library Index keeps track of all vital information including, Drawing Name, Current Borrower, Previous Borrower, Last Access Date, Drawing Number, Author, Current Location of a Drawing, and Description. ■

List Price: Synergis Network *Drawing Manager*, \$1,995 per network server.
Requires: 3COM or Novell 286 2.1x or later, DOS 3.1 or later. Synergis Technologies Inc., 593 Skippack Pike, Blue Bell, PA 19422; (800) 836-5440 or (215) 643-9050.

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edited by
Lori Grunin

Read Only

Reviews of the Latest Books for the PC User

Cures for the Word-For-Windows Blues

Microsoft's *Word for Windows* implements several innovations that set new capability—and complexity—standards for word processors. In addition to the features common to most sophisticated word processors, its macro language, Word Basic, is the closest thing to a real programming language that you'll find in a word processor. And its most spectacular advance is fields: hidden code that can create results, mark text, and produce actions.

When you combine this complicated software with documentation that is more an excellent technical reference than a hands-on user's manual, it's not surprising that a plethora of advanced how-to books have appeared on bookstore shelves. Here we look at four of the most recent arrivals.

■ *Working with Word for Windows*
by Russell Bortland
Microsoft Press, \$22.95

This \$22.95 book from Microsoft Press has the most attractive layout of the books listed here. It is well organized, emphasizing what it calls "Word's Four Pillars: Styles, Fields, Macros and Templates," and the discussion of mathematical typesetting is especially clear. Unfortunately, however, it lacks the depth and clarity that are found in Crane's book.

Microsoft Press, One Microsoft Way, Redmond, WA 98052; (800) MS-PRESS. ISBN: 1-55615-163-2.

CIRCLE 396 ON READER SERVICE CARD



■ *Word for Windows Companion*
by Mark W. Crane

The Cobb Group/Microsoft Press, \$26.95
The hype on the back of Mark Crane's book—"Any book can claim to be the best, but only one is: *Word for Windows Companion*"—turned me off. But pages of incredibly clear prose with lots of detail and useful tips soon put me in a forgiving mood. *Word for Windows* includes 34 auto-



matic styles. The manual mistakenly lists 35, but only Crane's book mentions this; a trivial issue but a telling example of the author's attention to detail. With the exception of graphics—where *Word for Windows* itself is weak—the book covers all the bases thoroughly, and is the best of the bunch.

The Cobb Group/Microsoft Press; One Microsoft Way, Redmond, WA 98052; (800) MS-PRESS. ISBN: 0-936767-15-4.

CIRCLE 397 ON READER SERVICE CARD

■ *Using Microsoft Word for Windows*
by David Dean

Osborne/McGraw-Hill, \$22.95
Focusing too much on mechanical issues, Dean's book provides the shallowest discussion of the software. For instance, the reader will not learn that there are three kinds of fields, a point crucial for understanding what fields are all about. There are also errors. For example, the book incorrectly claims that if you Edit Copy an Excel chart to the clipboard, Paste Link will



CAUGHT ON A TECHNICALITY

The \$19.95 *Microsoft Word for Windows Technical Reference* has three parts: the first and longest on the innovative macro language, a section on fields, and a final section—which is of more interest to developers than to end users—that addresses the Rich Text Format (RTF).

The description of fields is admirable, if a little dry. The central section on macros is disappointing, however; a good language manual should include cross references sorted by type of function and lots of sample code. The *Technical Refer-*



ence fails on all these counts, and much of its contents can be found in the TECH-REF.DOC, located in the library subdirectory created by the *Word for Windows* installation program. So, unless you need the RTF primer, I would advise you to print out the on-disk macro documentation and get a copy of Crane's book for a discussion of fields.—B.S.

Microsoft Word for Windows Technical Reference, \$19.95. Microsoft Press, One Microsoft Way, Redmond, WA 98052; (800) MS-PRESS. ISBN: 1-55615-288-4.

CIRCLE 400 ON READER SERVICE CARD

be unavailable in *Word for Windows*; that's only true if you close Excel before attempting the paste.

Osborne/McGraw Hill, 2600 Tenth St., Berkeley, CA 94710; (800) 227-0900. ISBN: 0-07-881498-7.

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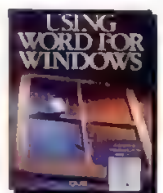
■ *Using Word for Windows*
by Ron Person and Karen Rose
Que Corp., \$22.95

In addition to covering all the bases, Person and Rose's book emphasizes the importance of using range names in hotlinked DDE and file imports from spreadsheets.

As with the *Technical Reference* (see the sidebar "Caught On A Technicality") and Dean's book, *Using Word for Windows* lists fields alphabetically rather than by subject—a more useful format—but I found its typo-

graphic layout to be the least attractive of the four books. Que Corp., 11711 N. College Ave., Carmel, IN 46032; (800) 428-5531. ISBN: 0-88022-399-5.

CIRCLE 399 ON READER SERVICE CARD



None of these books adequately cover DDE in macros; clear documentation about this topic appears to be elusive. (Although a thin, 100-page DDE primer is available for \$29.95 from WexTech Systems, Inc., 60 E. 42nd St. (1733), New York, NY 10165; (212) 949-9595). Aside from that and the less-than-complete treatment of graphics, Crane's book is the pick of the litter.

—Barry Simon

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Andrew Seybold's Outlook

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Speed For The LaserJet III. Why give up speed to get all the fonts you need? The Super Cartridge 2 snaps into the HP LaserJet III printer to deliver every ordinary font at full hardware speed and highest

resolution. Try a test—you'll see the difference. Nobody's slow with a Super IQ.

Our 17-page guide reveals everything you need to know about font accessories. There's a Super Cartridge for every HP LaserJet printer and many compatibles, priced from \$399 to \$799. And compatibility with all the software programs you'd expect (including WordPerfect and many others).

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by
Gus Venditto

Pipeline

A Look at the Trends Shaping the Personal Computer Market

Techniques to Decipher Handwriting Are Nearing Perfection in the Lab

The personal computer has changed nearly everyone's ideas about what's possible and impossible in this world. Yet even today, few people would believe that they'll soon be able to pick up a pen, scribble a few sentences on a computer screen, and then have those handwritten

words instantly available for editing in *WordPerfect*.

It's a little early to say exactly when you'll be able to do that, though it wouldn't be unreasonable to expect to see this happen next year.

The software that will perform this feat is being written by

GO Corp., a venture formed by two of Lotus's and Ashton-Tate's best creative thinkers, Jerry Kaplan and Robert Carr.

Kaplan was Lotus's principal technologist from 1985 to 1987 and a coauthor of *Lotus Agenda*; Carr was chief scientist at Ashton-Tate in '86 and '87 and was the designer of *Frame-work*.

They started working nearly three years ago on concepts for capturing handwriting with computers. The work is approaching its final stages.

Already, some of the major

software publishers have engineers at work on applications. *WordPerfect Corp.* is confident that it will have a word processor ready for the first devices soon after they ship. Lotus and Borland International are taking a broader view, looking for new types of applications that will make sense on a smart notepad. At least two companies—*Slate Corp.* and *PenSoft Corp.*—were formed this year for the specific purpose of exploiting this new technology.

And in the best endorsement

CONTINUES ON PAGE 64

Windows 3.0
Microsoft Corp.

WordPerfect 5.1
WordPerfect Corp.

Lotus 1-2-3 2.2
Lotus Development Corp.

PC Tools Deluxe 6.0
Central Point Software

Norton Utilities, Advanced Edition 4.5
Peter Norton Computing

Quicken 3.0
Intuit

Microsoft Excel 2.1
Microsoft Corp.

Fastback Plus 2.1
Fifth Generation Systems

ProComm Plus 1.1B
Datastorm Technologies

Direct Access 5.0
Delta Technology

The Top Ten Sellers list ranks PC business programs according to the total number of copies shipped to stores and resellers in the week ending July 13. The chart that appears to the left of each program name shows how the program's sales ranked each week for the last five weeks. The hash marks at the bottom of each chart represent each of those five weeks, beginning with the week of June 10. The list is based on shipments to more than 12,000 retail locations. It does not include sales made directly by software publishers and can not be interpreted as a complete picture of the entire software market.

Sales information compiled by Ingram-Micro D and PC Connection Inc.

Rankings are based on a net total of copies shipped to retailers; returns are subtracted from gross shipments.

This is the third straight issue with *Windows 3.0* at the top of the chart; it's safe to say that it's having a far greater impact than earlier versions. One residual effect is the boost it's given *Microsoft Excel*, which is at number 7 this week.

Pipeline

CONTINUED FROM PAGE 63

any fledgling company could ask for, IBM has signed on as the first licensee of the GO operating environment.

The first handwriting-smart computers were designed to help data collectors in the field store facts with a pen. Hand-held devices from Norand Corp., Telxon Corp., MSI Data Corp., and GRiD are being used to help sales service organizations store information throughout the country every day.

GRiD's GRiDPad was the first design to provide DOS compatibility, giving programmers a relatively easy way to develop applications that can accept the handwritten input. You can't run *WordPerfect* on the GRiDPad and have your printed characters translated into on-screen text, but you could use GRiD's applications toolkit to write software that would be compatible with your own DOS applications.

And of course, you can't use these devices for cursive or script characters. They understand only clearly printed block characters.

When GO's technology is fully realized, though, you will be able to call a *WordPerfect* document to the screen and then

scribble a correction or addition with a pen, and watch while the system changes your script into text characters, properly positioned in the document.

Full translation of handwriting is such a significant breakthrough that it's unlikely to come without a painful growth path.

Early machines will require

where. GO's prototypes are notebook-style, with an attached pen.

There's no reason that a desktop system couldn't be built, but GO's engineers believe its handwriting-input design wouldn't be feasible on anything other than a dedicated system.

Since IBM is only now starting to study the best uses for

When GO's technology is fully realized, you'll be able to call up a *WordPerfect* document and scribble a correction with a pen.

training, with the user providing extensive handwriting samples before any recognition can take place.

The GO engineers have also grappled with the idea of compatibility with other systems and concluded, for one thing, that DOS could not be altered, twisted, or expanded to accept handwriting. (It's rumored that Microsoft begs to differ and will make its own offering at some point, but it will need more than a little inspiration to match GO's innovations.)

The exact form of early GO-compatible devices are far from clear. The most likely type of computer would be portable so you could jot down notes any-

GO's techniques, it's too early to speculate on the exact form that the first commercial device will take or if it could be made to coexist on a system that runs DOS or OS/2.

New From One of the Baby Bells: Innovative Software

The hidden brain reserve developed by the Bell system is starting to make its impact on business in small doses.

The most recent innovation is a *Windows*-based program from Bell Atlantic. It's called *ThinX* and it defies easy explanation.

ThinX is probably one of the richest examples of object-oriented programming yet pub-

lished as a commercial product. It provides spreadsheet-like formulas and database-like sorts as objects that can be attached to bitmapped graphics.

ThinX makes the most sense when explained as a graphical database, but images are not treated as ordinary data fields: they're illustrations of the relationships between bits of data. This amounts to graphics for the sake of analysis rather than presentation.

This is not the kind of innovation we've come to expect from the regional phone companies; here's hoping it's the beginning of a new trend.

A First Look at *ThinX* is scheduled for next issue.

Discount Shopping Makes Its Way On-Line

As part of Prodigy's major overhaul (it adds VGA graphics, a mouse interface, and faster response time this month), cut-rate prices on a wide range of consumer goods will finally be within a modem's reach.

Until now, on-line shopping has been limited by "suggested list price" policies, and it hasn't caught on in a big way.

Now Prodigy is following the lead of most successful national retailers and adopting a "lowest price anywhere" policy.

Prodigy is a partnership of Sears and IBM.

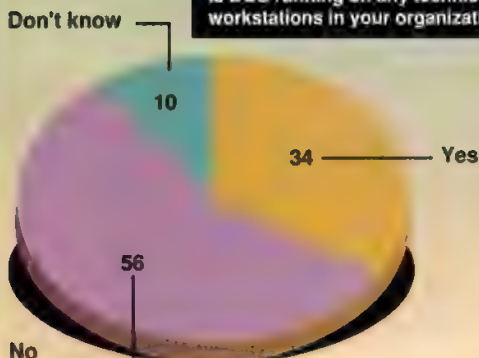
SURVEY

With Sun now selling a workstation for less than \$10,000, it's only natural to wonder about the convergence of that environment with DOS-based PCs.

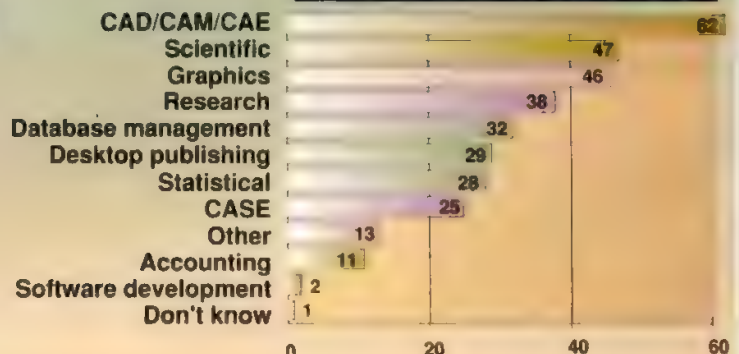
When we asked more than 1,000 callers to PC MagNet about technical workstations, 35 percent said RISC- or Motorola-based systems were being used in their organizations.

Although there's some overlap with PCs in the type of work these systems are used for, there's a clear tendency toward graphically oriented applications.

Is DOS running on any technical workstations in your organization?



What types of applications are being run on technical workstations in your company?



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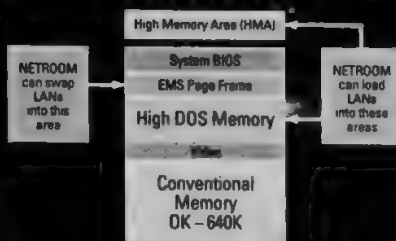
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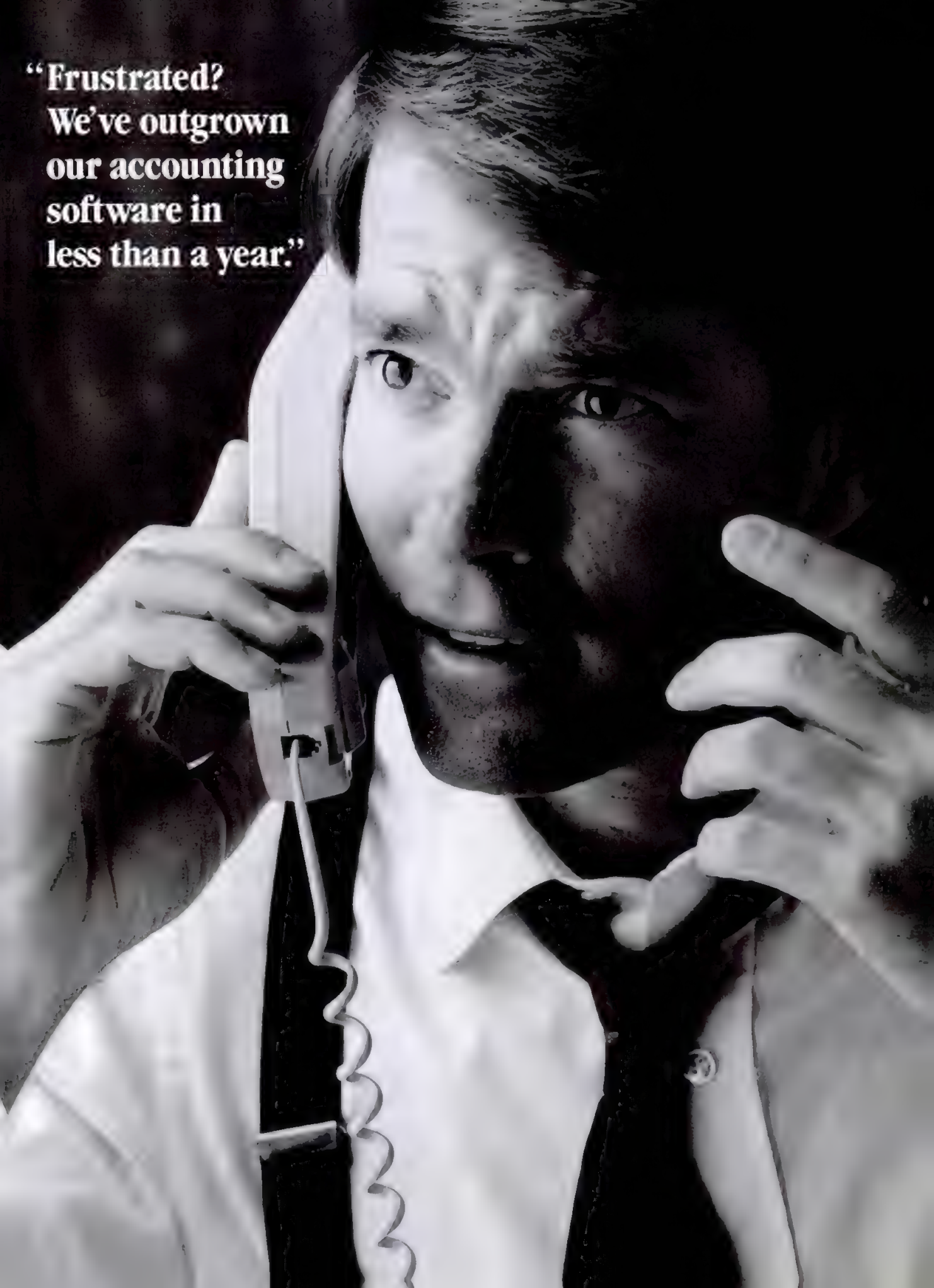
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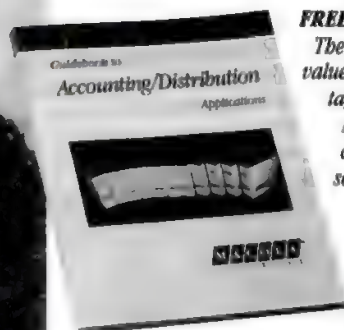
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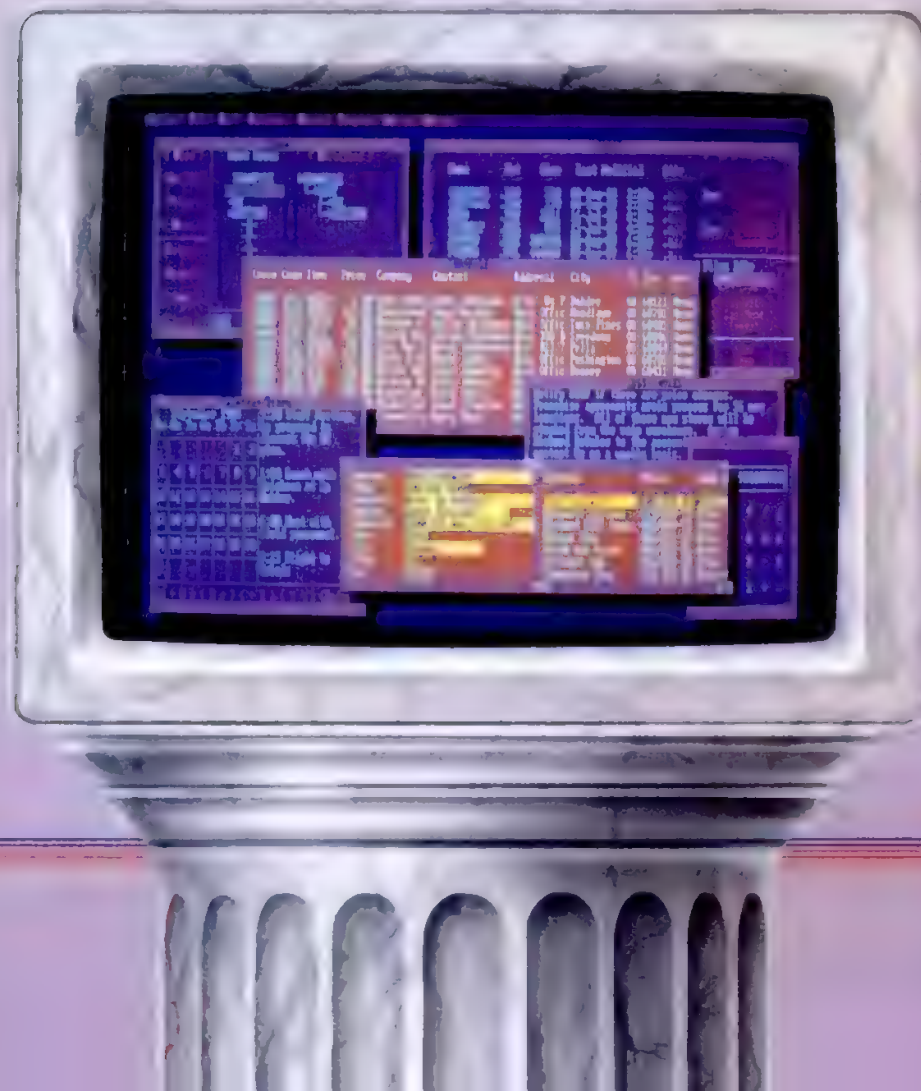
System Requirements: FoxPro operates in 512K RAM (640K recommended) with MS/PC-DOS 2.0 or greater and an 8086/8088, 80286 or 80386 microprocessor. For optimum performance, FoxPro takes complete advantage of any available EMS (expanded memory) or a math coprocessor.

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Why Johnny Can't Compute

Corporations bemoan the poor quality of students entering the work force. They have no one to blame but themselves.

Employers everywhere criticize the education system. College graduates can't read or write. High school graduates are virtually unemployable. Many bright graduates enter an executive training program and find themselves signed up for the corporate equivalent of freshman composition. Hourly workers lack the basic math, reading, and comprehension skills to operate today's high-tech equipment. "You can't send 'em on break 'cause you gotta retrain 'em," jokes many a line supervisor.

College graduates who master the basics run the risk of emerging overspecialized. They steep themselves in their discipline to the utter exclusion of everything else, sacrificing their comprehension of other aspects of business, or of life in general. The Bachelor of Arts degree barely qualifies most graduates to work on the lowest rungs of the corporate ladder. Corporations invest millions to recruit the best and brightest only to then teach them everything they didn't learn in school.

The education system and the real world are out of sync when it comes to computers. The gulf is enormous, but it can be spanned. It all starts in elementary school, maybe even in kindergarten or preschool.

BUSINESS TO THE RESCUE?

The first challenge is to get computers, real computers, into the classroom. In my family's local school district they're using Commodore PETs in the elementary schools and they're still loading programs from cassette tape. In a closed-ended environment such as that, software innovation need not apply. Of course, our local administration wants to upgrade, but it doesn't have any money. Fortunately, local and national businesses are coming to the rescue. Or are they?

If you save 1,500 proofs of purchase from Scott Paper Products line of consumer goods, your school gets credit for software. Promotions like this abound. The Computer Learning Foundation sponsored a similar program using Del Monte. PTAs save soup labels, receipts,

and proofs of purchase for a variety of products and redeem them for educational software. In our case it netted one lone copy of *Reader Rabbit*. Gosh, could the promoters spare it?

One local grocery chain encourages customers to save register tapes. The PTA can trade them in for credit on classroom computing equipment. Sounds good, huh? Well, \$300,000 worth of register tapes earned the local school an Apple IIC. Let's see now, if an average family drops \$100 each time it goes to the grocery store, that's 3,000 visits, never mind all the times people forgot to save their receipts. You can get a IIC for \$450, so the grocery chain is kicking in 15 cents per shopping trip. Given the grocery industry's low margins, it's a nice gesture. But how many other things could the members of the community have done 3,000 times that would have yielded at least \$.15 per excursion? Collecting each family's weekly accumulation of pennies would net that much money much faster.

I can't even begin to address the school's folly in replacing one obsolete computer with another. But this column isn't about fund raising, and it isn't about which hardware or software works best in the classroom. It's about



making our youngsters computer literate in a way that will be useful to them later in their education and in their working lives. Clearly, these promotions are being run by the wrong people. Personnel managers should be calling the shots, not brand managers.

We can get modern, relevant computers into the classroom with sufficient effort. But that's not enough. Our children need the right people to show them what computers are all

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Bill Machrone

about. People like you. If your company wanted to make a real contribution to local primary and secondary education, it would loan you out a couple of hours per week to conduct a computer club.

A teacher could do it, but I'll wager that there's nobody in your neighborhood who knows more about how PCs are used in the real world than you do. Besides, outsiders have advantages that teachers can't match, including being nothing more than an unfamiliar face. I grew up a stone's throw from Bell Laboratories. My school's science club was forever bringing in Bell Labs' staffers to have us breathe helium, stand on gyroscopic platforms, get charged up with a couple of hundred thousand volts of static electricity, or set off explosions. It was great fun, and it gave me a lifelong love of the sciences.

Kids don't need to learn computer science. They need an overview of the tools available to them through computers. Information retrieval technology is progressing at a headlong pace. They need to know how to get to the wealth of information in on-line services, CD-ROMs, and video disks. Imagine the show you could put on with nothing more than the stuff you could find at a local Tandy Computer Center: a CD-ROM-equipped machine running *Compton's Multimedia Encyclopedia*. Think of the inherent voyages of discovery in applications such as *PC-Globe*, or in games such as *Where in the World is Carmen Sandiego?* Elementary schoolers love The Learning Company's *Midnight Rescue* and *OutNumbered* games. They enjoy almost anything involving graphical output. High schoolers need to know how to organize their data for analytical thinking. They need a survey of what tools are available to them, when they're most appropriate, and how to use them. It's hardly different from woodworking shop, except that they're exercising their brains instead of cutting their fingers.

HANDS UP THE LADDER

User groups have been a powerful force in training and support for the last decade, and many are looking for new worlds to conquer. How about the computer literacy of students? User groups have shown themselves to be effective organizers and lobbyists. I'd like to see them turn that energy to the young--our future.

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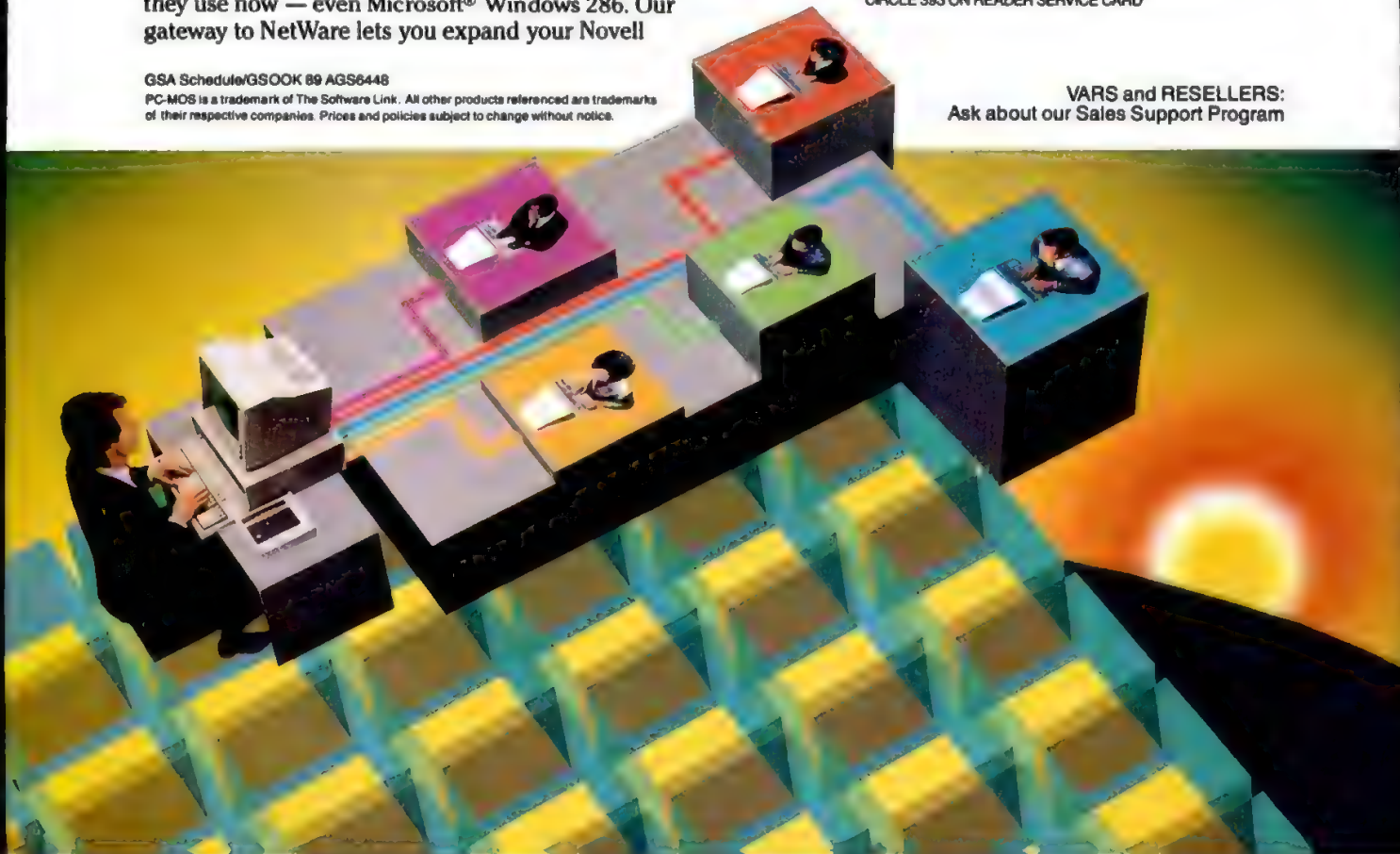
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John C. Dvorak



Trade Shows and The Future

If you think trade shows are just men running around in funny hats, think again. Not only are you being given the business, you're missing out on it.

Last June was nuts. I went to the American Booksellers Association (ABA) convention in Las Vegas and then flew to Atlanta Comdex hoping to swing through Chicago to check out the Consumer Electronics Show (CES). The next week I went back to Atlanta to the A/E/C CAD/CAM show having decided that I wouldn't go to MacWorld Singapore or to the International Computer Club event in Moscow which were on at the same time. I figured it would be too much effort since the next week I'd be going to PC Expo in New York, followed by the Seybold Digital World event in Los Angeles, which I eventually didn't attend.

There were probably three or four other events simultaneous to all these that I didn't even know about.

Enough is enough! Sometimes we have to sit down and do some work!

Well, folks, this trade show thing has become a major trend in business and we'd better get used to it. While people moan and groan, the trade show industry is just getting started. Events will continue to increase in both number and size well into the next century. Most convention facilities (even the newest ones such as Moscone Center in San Francisco) are being expanded to attract bigger and bigger events. New convention halls are cropping up everywhere. And most new hotels are designed with the conference industry in mind as they provide larger ballrooms and more and more meeting rooms than ever.

The face of business is changing, and we are witnessing the beginning of the "office without walls"—a phenomenon created by computers, modems, networks, and the decentralization of corporate entities. I joke when I say, "Sometimes we have to sit down and do some work." The new decentralized business and its necessary gatherings are much more efficient than the aimless roaming and nonstop travel experienced in the past.

A trade show such as Comdex, for example, is the model of efficiency, no matter how horrendous it may seem. Clients, salespeople,

corporate presidents, reporters, PR people, people looking for jobs, researchers, and developers are all together in one place for a week to have meetings. The most efficient showgoers have calendars booked solid, capitalizing on the opportunity to make contacts. Show week can be a very profitable few days for the hardest workers. While these gatherings are thought of as social events, they are anything but social. Even the social aspects of a large show such as Comdex are nothing more than an extended business meeting hidden behind a social facade so that the overworked legions have an excuse to drink vodka and beer while doing business. At a social event there'd be more talk about baseball than business and everyone would try to get to know each other personally. There is little true social interaction as business chitchat and deal making continue into the night.

Essentially these social events are the equivalent of cold-call sales, while the show itself is a no-cold-call heaven for everyone involved. As a result, business booms. The sharpest people can't get enough of these gatherings since so much can be accomplished in so little time. If American industry has an edge

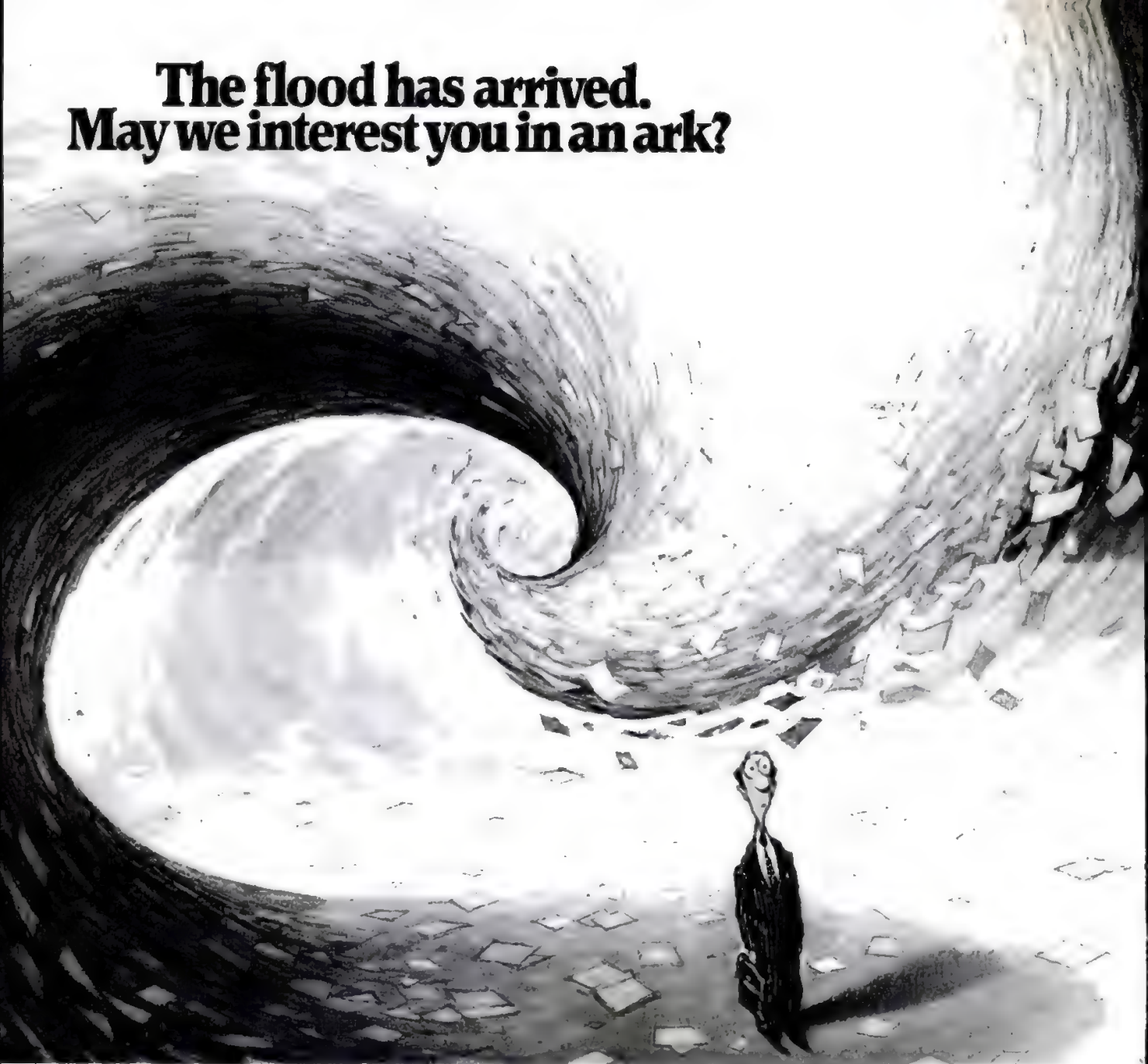


ILLUSTRATION: JEAN-FRANÇOIS ALLAUX

over the rest of the world, it is the modern trade show—a unique way of doing business. Trade shows are a permanent part of the modern business scene. For the computer industry, these shows are critical to its success.

I now laugh when I hear how someone wants to avoid a major show because he has too much work to do, and the show is crowded and expensive to attend. Talk about missing the point.

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Inside Track

While AMD has almost completed a **rumored 386 clone**, the most talked about 80386 clone this week belongs to

NexGen with its F86 chip, a purported 386 clone which appears to be aimed at a **486/586 level of performance**. The President of NexGen Microsystems, Thampy Thomas, published a chart in the *Microprocessor Report* (call (707) 823-4004 for subscription information), which showed some transistor counts for this new chip. I suspect that this F86 will not be a single chip since it will contain, according to the chart, 5.7 million transistors. The jam-packed Intel 80486 has a little over a million. The F86 sounds expensive.

Thampy (is that his real name?) is a **big-time defender** of CISC architecture and asserts that RISC is "not differentiated by absolute levels of performance, efficiency or ease of implementation, number of instructions, or machine organizations for code generation by compilers. RISC is just a NEW instruction set."

This debate over CISC versus RISC is degenerating into an argument over semantics and both sides are missing the point: removing the microcode from the silicon and placing it in software where it belongs—the **key benefit** of RISC design. When people discuss the future of RISC versus CISC most observers now say "the future CPU will be a combination of RISC and CISC." What's THAT supposed to mean? Will it be a complex reduced instruction set computer or a **reduced complex instruction set computer**? The whole thing's laughable.

By the way, NexGen is the company in which Compaq invested some cash hoping to find someone who might be able to second-source the 386 in case Intel falters.

Genuinely Interesting Software Dept.: The most interesting package that has passed my desk in a while is an unusual paint program called *Fractal Graphics* (Cedar Software, R1 Box 5140, Morrisville, VT 05661; (802) 888-5275). In addition to being something of a tutorial in fractals, it is an uncommon .PCX-compatible paint program that uses fractals and other new concepts to generate images and patterns unlike anything I've ever seen before. It helps to have a floating point chip and a high-speed chip in your box for this program. While the program misbehaves a little, the capabilities more than make up for idiosyncratic irritations. You can create some **wild-from-another-universe** images with this thing. The package normally costs \$79, but mention that **you read about it in Inside Track** and the author will sell you the program for a **special price** of \$59. (We do our part.) Highly recommended.

A Note to Coders Dept.:

More and more of the software I'm looking at has error messages which, on a 486, flash on the screen and can only be **read subliminally**. This sloppiness isn't a good sign, and these packages won't receive any mention in this column. Get with the program, machines are going faster and faster.

Loose Cannon Dept.: In a short interview a couple of months ago in *PC Week*, Bob Metcalfe, founder of 3Com and inventor of Ethernet, said, "Microsoft will continue to expand

its death grip on the personal computer industry. I'd like there to be a great deal of **competition** and creativity, and Microsoft will prevent that." Metcalfe's retiring and said he may go into teaching or get involved with artificial intelligence (isn't that dead already?) or become a **right-wing journalist** starting as "an entry level reporter." He began this interview by bemoaning the fact that he wasn't made president of 3Com. Hey, Bob, cut down on the coffee!

There Are Catalogs and There Are Catalogs Dept.: Corporate Software has released its latest **1,108-page catalog** of software, which is pretty much a compendium of all the major software available. Called the *Corporate Software Guide*, it's a **great reference book**. Call or write Corporate Software, 275 Dan Rd., Can-

ton, MA 02021; (617) 821-4500. If you convince them that you're a big-shot buyer, then the book is free. Worth every penny.

Programmers of the Future Dept.: While people have been trying to get code out of China and India, they're missing the **easy opportunities** afforded by more-Western-minded peoples. Recently I spoke at the **Commercial College of Iceland** in Reykjavik. It seems that this new school is becoming a **hotspot** for OS/2 programming. I was very impressed with the student projects done there. Many were immediately marketable. Iceland, the last refuge of the Vikings, with its weird 24-hour daylight summers and 24-hour dark winters, is a perfect environment for programmers. They seem to enjoy it, with as many **female** programmers as there are male. (Sexism is lost on these people. They have the first democratically elected female president, in fact, and think nothing of it.)

Developers looking for new talent could do worse than contact the Iceland Consulate and find a way to visit the Computer Science Department of the Commercial College. **It's a gold mine**. Iceland is also an interesting little country to visit. The land is beautiful, and everyone speaks some English there.

Iceland, with its
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daylight summers
and 24-hour
dark winters,
is a perfect
environment
for programmers.

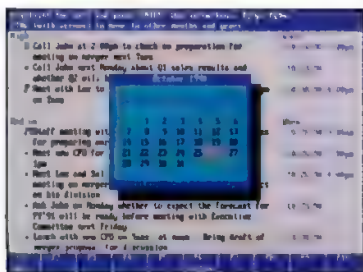
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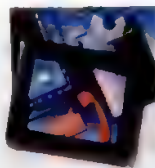
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A special commission has been appointed to study ways in which the public can be made aware that FASTBACK PLUS' Advanced Error Correction, easy-to-use menu, flexible file and directory selection, automated backup options and other features allow even beginners to make fast, foolproof backups.

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CIRCLE 232 ON READER SERVICE CARD

Jim Seymour



900-Numbers: Where Support is Headed?

Technical support is an increasingly high-cost component of the software industry. If you need help, you'll have to pay for it.

This special service-and-support issue represents more than a year of planning and research. That planning job hasn't been made easier by the changes that have rippled through the PC support world during that time.

Over the past 12 months we've seen several important moves towards new standards for supporting PC users. Some—such as 24-hour telephone support, led by WordPerfect Corp. in software and Northgate Computer Systems in hardware—are unquestionably Good Things, destined to win even more friends for those companies and, inevitably, to push other firms into similar programs.

Other changes, such as the growing movement away from toll-free 800-numbers, sometimes to pay-per-call 900-numbers for tech support, are less universally acclaimed by PC users. Some see this as a shameful abdication of the software companies' responsibilities to customers. Others say it's simply greed at work.

I spend a lot of time talking with software firms about their businesses, including support policies and costs. I'm convinced the emerging pay-for-service approach marks a permanent change in the way PC software is supported. And though many *PC Magazine* readers won't like these changes, I'm also persuaded these New Realities of PC support are a good idea.

First New Reality: We're seeing a fundamental differentiation in support practices among software publishers in an effort to divide their customers between business users and individual users.

Second New Reality: Toll-free 800-number support is dead for mainstream PC software products. A few companies (most notably, WordPerfect) haven't noticed that yet, but they will—soon.

Why? Business users couldn't care less whether they have to pay for a support call. It's not *their* money. In this version of the Daddy's Money phenomenon, their company will pay for the call. Users want answers, and they want

them fast. The cost of the call is simply too small—even when it's multiplied by hundreds or thousands of PC users in a large company—to show up on that company's balance sheet.

While making support calls toll-free no longer is an issue for corporate PC users, the quality of service is. How quickly the call is answered, how well trained the person who handles the call is, and how quickly the user can get off the phone with a useful answer are critically important. Those phone lines and training cost plenty. *Someone* has to pay.

Third New Reality: PC software companies will follow, revise, and recast the models created years ago by mainframe software firms that sell support on an annual basis. These annual support contracts will include free minor updates, low-cost major upgrades, priority phone and fax support, and on-line support such as electronic bulletin boards. The contracts will also carry hefty price tags: \$5,000 to \$10,000 per year. And up.

Fourth New Reality: The surge of interest in 900-number, pay-per-call support is both a stalking horse for those annual service agreements and a way of separating customers into business and individual categories. Publishers

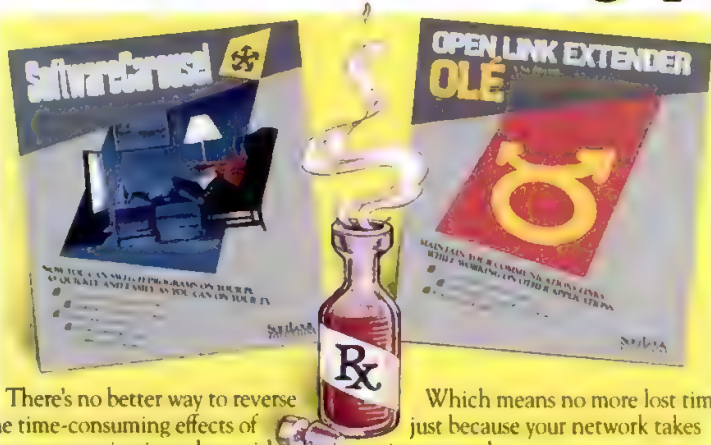


want to force customers into one group or the other. Select either, but select you will.

Why are these strategic changes in the cost and delivery mechanisms for support now becoming apparent?

The bottom line is that support costs a lot. It's expensive to recruit, train, house, and retain good phone-support people. Front-loading that cost—building support expenses into the price of every unit sold—no longer reflects

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CIRCLE 351 ON READER SERVICE CARD

Jim Seymour

the needs of most software buyers.

When we were all new to PCs, the great majority of customers could be assumed to need 3.5 calls of an average duration of 10.2 minutes each, over the first 3.8 months of use. So spreading the cost of post-sale support across *all* customers was both fair and good business. Now though, users are so savvy that many need no telephone support. Others work for companies that provide that support internally. Why, the argument goes, should these customers be assessed an upfront charge for support they'll never seek?

And with margins shrinking in the software business and aggressive price-shopping by almost every software buyer, publishers have every incentive to strip as many costs as possible out of the purchase price, both to compete effectively and to support their sagging gross margins.

Support costs are the first, easiest, and most obvious to go.

ENJOYING THE STATUS QUO

I know: Some of you think the system is fine as it is. You enjoy the support-costs subsidy provided by large-volume software buyers. And the idea of paying so much a minute, or a flat fee per call for 900-number support will make you think twice before seeking that support.

"Of course!," reply the software vendors. That's part of the plan, too. Reduce support demand to include only those issues not addressed in the manual. Technical support representatives learn the first day the support-person's silent and constant exhortation: "RTFM!", an unprintable plea to read the manual.

Microsoft now offers \$2 per minute support for DOS users. Aldus offers \$15 per call PageMaker support. Both will happily take your calls, but both would much rather sell your company its annual service agreement. But the admission price is steep: Microsoft charges \$9,500 a year for access to its priority telephone support and on-line database with a limit of four users per contract; Aldus charges \$1,000.

I find this move away from free support after some initial period, typically 90 days, fair and sensible. Whether you choose to pay in advance or to pay each time, support costs are becoming visible, explicit, and assessed by demand.

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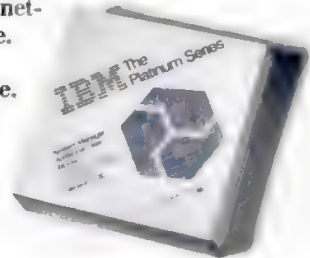
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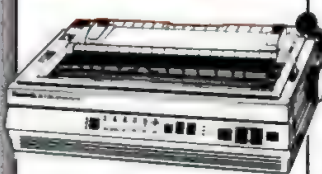


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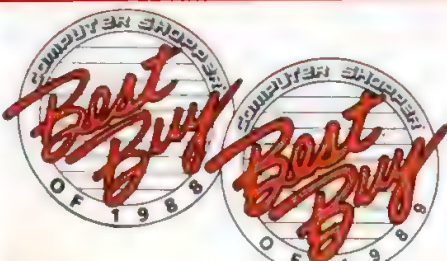
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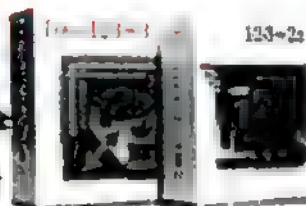
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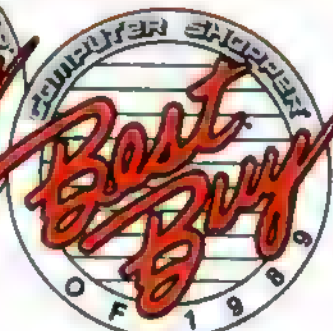
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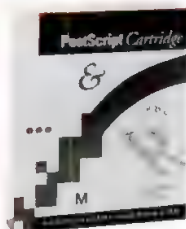
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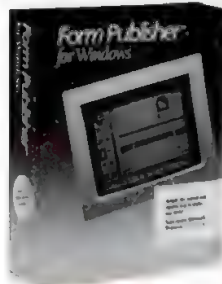
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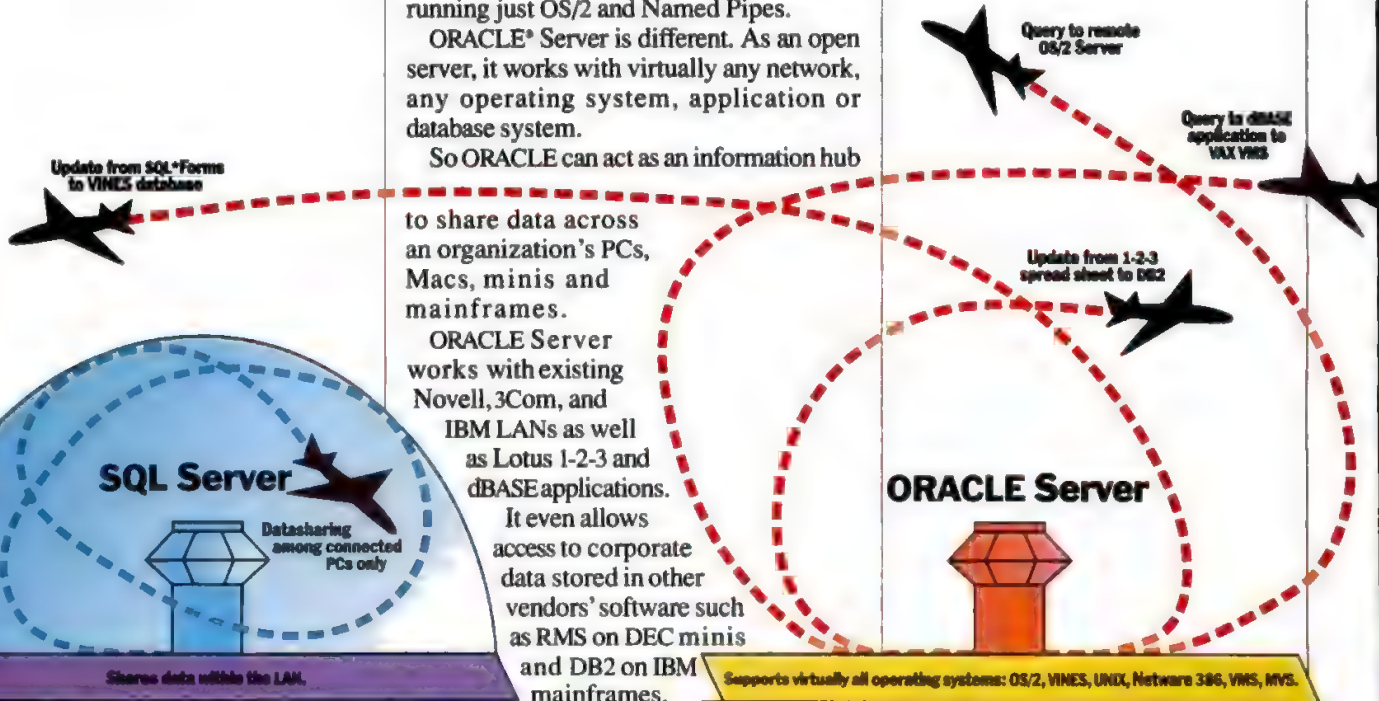
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Microsoft's "Window" To OS/2

Windows 3.0 will light the way to OS/2, not eclipse it. And that's really what Microsoft always wanted.

When Microsoft introduced *Windows 3.0* earlier this year, it became the fashion for some industry analysts to proclaim that OS/2 was dead, or at least indefinitely postponed. *Windows 3.0*, they argued, would be all users would need for the foreseeable future.

They're wrong. The real relationship between *Windows 3.0* and OS/2 is quite different from what these analysts anticipated. Far from being a rival to OS/2, *Windows 3.0* will build the foundation for adoption of OS/2 by the majority of users in the months ahead.

Windows 3.0 represents neither a change in Microsoft's strategy regarding OS/2 nor an effort by Microsoft to promote *Windows 3.0* as an alternative to OS/2. *Windows 3.0* is the most recent manifestation of what has been a remarkably consistent policy by Microsoft. That policy,

simply put, has been to make *Windows* the crucial step on the way toward OS/2.

The reason this strategy hasn't always been obvious is that Microsoft had to make tactical compromises that gave the appearance of deviating from its *Windows* to OS/2 path. The most important deviation concerned Microsoft's relations with IBM regarding OS/2. Much of the apparent inconsistency traces back to IBM's original reluctance to embrace *Windows*. A look at recent history will make Microsoft's policy regarding *Windows* and OS/2 clearer.

OPEN ARCHITECTURE GROWS UP

The open architecture of the original IBM PC, XT, and AT is widely held as the key to IBM's success. Many believed that the ready availability of MS-DOS and the relative ease with which other vendors were able to build compatible systems contributed significantly to the success of IBM's personal computers.

That was not the view held within IBM. On the contrary, many IBMers saw the open architecture of the original PC as an unfortunate mistake.

IBM had long waged war against vendors of plug-compatible mainframe systems and peripherals. The closed, proprietary architecture of IBM's mainframe and minicomputer systems was an effective weapon in that war. Although manufacturers like Amdahl and NAS were able to introduce compatible mainframes, the proprietary nature of IBM's hardware made this difficult and very costly. Also by constantly upgrading and modifying its multiple virtual system (MVS) operating system, IBM forced compatibles vendors to play an expensive game of catch up that IBM always won.

The personal computer industry in the early 1980s was a completely different story. The original IBM PC was introduced by what was then an IBM independent business unit. The *Technical Reference* manual not only provided detailed designs of the system, but actually contained the source listing of the BIOS routines.

IBM's corporate management had no idea how important personal computers would become. If the white-shirt set at Armonk knew just how lucrative a genie it had let out of the bottle, the original PC would have been far more carefully protected. The same open archi-

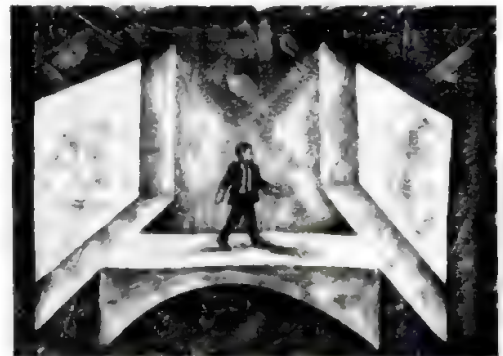


ILLUSTRATION: JAY BELMORE

ture that made its PC so successful began working against IBM. Starting with the introduction of the Compaq portable in 1983, a growing list of compatibles vendors challenged IBM. By 1985, hundreds of vendors were selling IBM PC, XT, and AT clones.

IBM had to address its falling market share, and the response came with the introduction of the PS/2 line in April 1987. Lurking behind these new computers was a hidden agenda to

William F. Zachmann

undo the open architecture of the original IBM personal computers.

With the PS/2 line, IBM maintained the appearance of an open architecture while moving back toward a more controllable environment. The PS/2s would be open to third-party software, peripher-

als, and add-in cards, but not to clone makers. Proprietary innovations like the Micro Channel architecture would prevent them from building compatibles.

The hidden agenda behind IBM's April 1987 introduction of the PS/2 and of OS/2, therefore, was to try to stuff the genie back in the bottle. However, as readers of the *One Thousand and One Nights* can tell you, recapturing an escaped genie isn't always possible. The

world had grown accustomed to the open architecture, lower costs, and better systems.

AND WHAT OF MICROSOFT?

So where do Microsoft and *Windows* fit in this open and closed tale? Despite the major role that MS-DOS had played on IBM PCs, it was unclear prior to IBM's PS/2 introduction, whether Microsoft would continue to provide the operating system for IBM personal computers.

IBM hoped to derive a proprietary advantage from OS/2, as well as from its PS/2s. Today, IBM's OS/2 Extended Edition is a remnant of that hope, but during 1985 and 1986, IBM had more-ambitious OS/2 intentions.

One interesting IBM scenario involved Microsoft only in the foundation structure of OS/2, which eventually appeared as OS/2 Standard Edition 1.0. Microsoft would develop and have the rights to license only the character-mode multi-tasking OS/2 kernel. With this plan, IBM would have created a proprietary graphical user interface for OS/2 at IBM's software development facility in Hursley, England. To complete its retrenchment, only PS/2s would have been capable of running IBM's proprietary GUI.

Instead, Microsoft persuaded IBM to make *Microsoft Windows* the foundation for the OS/2 Presentation Manager. To do so, Microsoft made important compromises with IBM, including significant changes to *Windows*' application program interface (API). Microsoft's strategy from the start was to make *Windows* a stepping stone to OS/2 PM, even making PM a strictly compatible superset of the *Windows* API. Because IBM, in its efforts to gain a proprietary advantage with OS/2, wanted nothing to do with *Windows* or any other open architecture, Microsoft temporarily downplayed *Windows* so that it could preserve its strategy involving OS/2.

Those who claim that Microsoft has "repositioned" OS/2 as "*Windows Plus*" are missing the point. *Windows* is not a deviation; it's a reassertion of Microsoft's nonwavering strategy: to make *Windows* the crucial step toward adopting OS/2.

IBM's efforts to move away from the open architecture of the PC industry created the appearance of contradictions in Microsoft's position with regard to *Windows* and OS/2. IBM's failure to regain a proprietary edge with the PS/2 and OS/2 makes the time ripe for Microsoft's original strategy to emerge intact. ■



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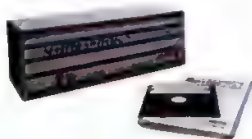
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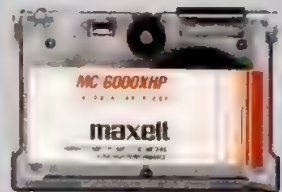
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LET'S START BY LOOKING AT THE POWER SUPPLY.

When was the last time you saw a computer company talk about their power supplies, either in their advertising or on the telephone? Chances are, you've never run across an ad or conversation about power supply quality. Yet power supplies are one of the most critical components of your system. Why?

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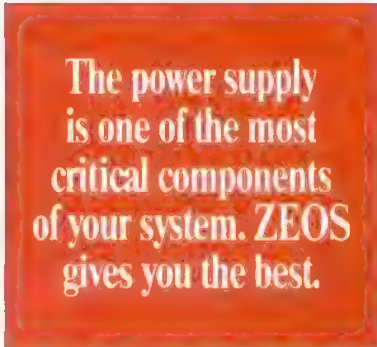
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They include CMOS failures, memory failures, disk drive boot problems, EMI emissions and more. A poorly conditioned power supply can send voltage spikes across your motherboard and expansion cards that will dramatically reduce the life expectancy of these components.

At ZEOS labs, we have invested thousands of dollars in power supply testing equipment and we have thoroughly tested power supplies from dozens of different manufacturers. These power supply vendors offer their supplies to many of the computer companies selling systems on the pages of this magazine. What we found was alarming.

The vast majority of the power supplies tested produced some sort of problem. Many simply didn't deliver the rated wattage under typical loads. Others put so much noise on the bus that they interfered with some of the

expansion cards. Others were simply flat out dangerous; they contained no over voltage protection circuitry (it costs a little more). When an electrical short occurred they would shut off only when something burned up! One of the more promising candidates,



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used by one of the world's largest computer companies, looked good initially but failed EMI (radiated emissions) testing.

There were few really good power supplies. The very best

we found were more than double the cost of the typical power supplies. Those are the ones we chose to use. The very best, and the most expensive.

This year the *additional* cost to ZEOS for providing our customers with these top quality power supplies will be over \$3,000,000.

The extra spending starts right with the ZEOS 386SX 200 Watt supply. It is custom designed and manufactured. Not because we couldn't find something else. But because nothing else was good enough.

In our larger systems where we believe our customers' power requirements will be greater, we spend even more. As an example, every ZEOS 25 and 33 MHz '386 system leaves our factory with a minimum of a 250 Watt TurboCool® power supply as standard. And our '486 machines in vertical cases are shipped with a 450 Watt TurboCool supply as standard.

Power Supplies cont.

These babies are definitely not cheap! If you don't believe us, check the prices for yourself. The 250 Watt TurboCool will cost you nearly \$200 and the 450 Watt supply will run around \$350.

TurboCool supplies are simply the best money can buy. That's why we use them. Other system vendors *may* offer 250 watt supplies but chances are they're not nearly the quality nor do they offer the critical cooling capacity of the TurboCools. Which brings us to the next topic. The importance of cooling.

KEEPING COOL IS KEEPING RELIABLE.

Cooling is critical to any computer system. Why? Because at elevated temperatures, the integrated circuits (IC's) in any computer can fail catastrophically; but even if they don't, their electrical characteristics frequently undergo intermittent or permanent changes. Not pretty.

Check out their specs and you'll find manufacturers of hard drives and other peripherals specify a maximum operating temperature for their products. If the specified temperature is exceeded, they are not certified to function properly. For most hardware devices the specification is 45°C to 50°C (113°F to 122°F).

Yet in a loaded PC, operating temperatures can easily reach 55°C (131°F) or higher. The result can be memory errors, hard disk read-write errors, faulty video display and other problems not commonly recognized as heat related.

And it's not just performance that suffers. Temperature is directly related to how long your computer will last. Why?

COOL COMPUTERS LIVE LONGER.

The life of an electronic com-

ponent is directly related to its operating temperature. As a general rule, each 10°C (18°F) temperature rise reduces component life by approximately 50%. Conversely, each 10°C (18°F) temperature reduction will increase component life by approximately 100%. That's why ZEOS makes such a big deal about our cooling systems. Proper cooling helps maximize reliability and increases the life of your computer.

That's right! Lowering the interior temperature of your computer by only 10°C can double the life of the components inside.

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That translates into
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And the more components you put into your system the more cooling it requires. That's why ZEOS uses TurboCool power supplies in our larger systems. But we don't stop there.

TWIN COOLING FANS MOVE EVEN MORE AIR.

In every ZEOS Vertical system and every ZEOS SpaceSaver desk top case, we have added a *second* cooling fan. This additional cooling fan moves even more cool life-giving air over the interior components of your system and *further increases* the life and reliability of your computer. Ask the others if their systems have this additional cooling. Chances are they don't. But that's why you're buying from ZEOS! Quality "under the hood." Let's talk for a minute about other typical examples of ZEOS quality.

HOW ABOUT TOP QUALITY VIDEO!

Quality video from monochrome on up. Let's start with our monochrome (TTL) systems for instance. There we use only genuine Hercules® brand video cards. Remember Hercules? They virtually invented the monochrome graphics video card, but most computer makers don't use the Genuine Hercules cards anymore. Why? Because they cost anywhere from two to three times what cheaper Hercules "compatible" video cards cost.

But if quality, reliability and compatibility count, you definitely want the best—Genuine Hercules monochrome cards. We've tested maybe 30 "clone" Hercules cards over the years. Some are simply incompatible with certain software, others are flat out junk. So if you're buying a monochrome system, and someone tries to filch a Hercules "compatible" card on you, be careful. Genuine Hercules brand monochrome cards are the best and that's what you'll get with your new ZEOS monochrome TTL system.

Of course when it comes to Hot VGA Video two names come immediately to mind. Paradise®, the industry standard and Cardinal®, with their Editor's Choice beauties. We use them because they're the best and you deserve nothing less. But the video world is among the fastest changing segments of our industry. We're constantly evaluating new video products for incorporation into our product line. That's why we don't build video directly onto our motherboards—things change too quickly for you to be locked into any one particular performance level forever.

WHAT ABOUT MONITORS?

Recently we decided to take a close look at monitor quality. We brought in a number of other brand name monitors to compare with our ZEOS OEM monitors. The results were astonishing.

First, we took some of the biggest names apart and discovered workmanship that was, at best, shoddy. Parts were stuffed in the circuit boards haphazardly, resistors were not fully inserted, chips were not seated properly and acidic and corrosive solder flux was not removed from the circuit boards after soldering. Not something we would consider selling!

A close examination of the case housing revealed a cheap and thin outer shell. We couldn't believe it, so we called in more monitors for inspection. The results were the same. And these are the monitors many others in this business are trying to sell you.

ZEOS monitors on the other hand are well manufactured. The quality of the circuit board assemblies is superior to any we have examined. Too, the monitor case contains a metal interior with a thick rugged molded exterior. They work great and provide video that's among the best in the business. That's ZEOS quality. And we're proud of it!

FLOPPY DRIVES BY TEAC: HERE'S WHY.

There is no reason to settle for anything less. Test after test after test yields the same results. Teac makes the best floppy drives in the world. That's it.

As an example, their 1.2's work flawlessly with 360K diskettes, something many others don't do.

And they stay in alignment too. A lot of other floppy drive brands work at first but the heads eventually move out of alignment. This results in either random read/write errors or complete drive failures. It's not worth the trouble. If you don't get a Teac floppy drive with your system, tell them to leave the floppy out altogether and go out and buy yourself a Teac. Of course you could save yourself the trouble and just buy a ZEOS system to begin with. ZEOS uses only Teac floppy drives because

only the best is good enough. Speaking of the best, what about the lowly serial and parallel port cards?

ZEOS I/O CARDS. NONE BETTER.

If there ever was a reason for ZEOS to manufacture its own products, this is it. You can't believe how much trouble a cheap I/O card can cause. We must have gone through ten potential suppliers of I/O cards before we threw our hands up in the air, marched into the Engineering Department and said, "Design the perfect I/O card! Make it reliable, easy to use and well documented."

You will appreciate
High quality ZEOS
video subsystems.
They're the best
in the business.

Our Chief Engineer looked at us and said, "An I/O card? You want us to design a simple I/O card! That's an eighteen dollar item. You can buy them anywhere all day long."

But that was the problem. Buying an I/O card was easy. Buying a good I/O card is next to impossible. So we set about designing and manufacturing our own.

Thousands of I/O cards later, it stands as one of the simplest yet best product decisions we've ever made. Our manufacturing cost on this little item is more than double what we could buy the cheapies for, but quality and reliability are 110% better!

Speaking of I/O, how about disk I/O?

HIGH SPEED, HIGH QUALITY. ZEOS DISK SOLUTIONS.

At ZEOS we match top quality

disk controllers and disk drives with the needs of our customers. We select only the very best the industry has to offer. The MTBF (Mean Time Between Failures) on many drives we sell are in excess of 50,000 hours. Our controller cards are top drawer as well. And talk about a selection!

We have all the interfaces available including IDE, RLL, ESDI, SCSI, and MFM. We offer them all because we know each has its specific advantages.

As a general rule, most typical users will prefer IDE or RLL. These interfaces are fast and easy to use. Our new IDE offerings provide transfer rates as high as 4 Megabytes per second and seek times between 17 and 25 milliseconds.

Our RLL systems use the Adaptec RLL controller. It's the hottest RLL card on the market. We consider them the best too. Adaptec's a good outfit. And their controllers carry a five year manufacturer's warranty so you know they're well made. And they perform well too.

When we order the Adaptec cards we pay a little more to have an 8K SRAM cache loaded on each one. This look ahead cache is resident on the disk controller card and further enhances performance. It's simply the best RLL controller on the market. That's why we use it.

Customers who prefer ESDI (Enhanced Small Device Interface) or SCSI (Small Computer Systems Interface) find ZEOS ready to provide them with every high quality, high performance option they'll need. We have our own ZEOS SCSI controllers with the I/O ports built right on the cards. And for customers who want a SCSI card with a resident processor of its own, we provide the incomparable Adaptec 1542 SCSI controller. But we don't stop there either.

Disk Controllers & Disk Drives cont.

INCREDIBLE CACHING CONTROLLERS TOO.

Because Performance Junkies really appreciate DPT caching disk controllers which can accommodate up to 16MB of memory cache on the controller itself. We sell a lot of them with our higher end '386 systems. DPT controllers provide effective transfer rates of approximately 4 Megabytes per second and access times approaching one-half of one millisecond.

And the new ZEOS '486 EISA system can utilize the incredible 32-bit EISA SCSI Caching Controller which delivers Data Transfer Rates up to 25 Megabytes per second and can yield effective seek times of less than one millisecond.

So no matter what type of ZEOS system you purchase, you can count on reliable, high quality, high performance drive solutions designed to meet your needs.

FAST MEMORY. A KEY TO FAST SYSTEMS.

We've covered Hot Video and Fast Drives. How about Fast Memory?

Don't be confused by cheaper and slower "page mode and page/interleave" memory addressing schemes on motherboards. Paging is virtually the slowest thing going in '386 systems. If someone tries to convince you "page interleave" memory is "zero wait state," start asking questions. As a rule of thumb, memory addressing speeds from the fastest to the slowest fall in this order:

Fastest:

Conventional memory addressing. This requires very fast memory with all executable code resident in memory being processed at the speed of the processor. Very

rarely used in high performance systems due to the cost.

Next Fastest:

Cache memory. The most common method for high speed memory systems, number two in actual speed behind conventional Zero Wait state memory. Yields around 90+ percent Zero Wait performance. Usually the larger the cache the better.

Slowest:

Page mode and Page/Interleave memory addressing. The slowest of the group, this method results in speeds as low as around half a wait state.

The reason page/interleave memory addressing is usually

High speed disk drives and high speed memory complement ZEOS motherboards. Perhaps the fastest available anywhere.

found only in low end systems is because it's slower. And it's cheaper for the manufacturer. So when someone tells you they're selling you a system that is "Zero Wait State," be sure to qualify the term and ask which method of memory addressing they are using.

JUST A FEW MORE ITEMS TO CONSIDER.

OK, we've covered a lot of things many other computer sellers ignore. They ignore them because nobody bothers to ask. If nobody asks, it affords a chance to cut corners and save money. That's fine for the computer hawker but it's bad news for you. At ZEOS, we care and we care from the ground up. There are a few remaining hardware areas we'd like to cover

here including cases, motherboards and certifications.

A CASE OF QUALITY.

Cases are more important than you think. At ZEOS, our cases are custom manufactured. They're designed to the point that we have patent applications pending not only in the United States, but in foreign countries as well. But why does the case matter?

Several reasons. EMI (Electro Magnetic Interference), durability, expandability and more. Take the new ZEOS SpaceSaver case for instance.

There is nothing else like it. The ZEOS SpaceSaver features twin cooling fans and room for up to six drives. Yet it has a smaller footprint than a typical full size case. It is also perhaps the most rugged desk top case built.

You'll note its rolled edges on the bottom frame. And how each edge of the cover is received into a channel as it slides on. Pay particular attention to these channeled and overlapping edges. These case edges were designed to dramatically reduce EMI emissions while increasing the overall strength of the case.

Rugged, smaller footprint and more space. That's the ZEOS "no compromises" way of design.

We note with particular amusement how some people are touting so called "slim line" cases. Unfortunately they are also slim in expandability. Their power supplies are often woefully inadequate both in terms of available wattage and cooling capacity. And there is precious little room to add more options in the future. Where are you going to put that extra floppy drive, hard drive and tape backup you might want to add later?

Slim line cases are all right for terminals or low performance, low enhancement systems, but they simply don't give you enough

room, power or cooling for the future if you're at all interested in expandability.

And you really don't save that much space. For instance, when you measure the actual footprint of a so called slim line case, you'll find a difference from our ZEOS SpaceSaver case of only an inch or two, if that. The most significant space savings is usually in the height of the case. So unless you're worried about low flying airplanes in your office, you're better off to not box yourself in.

Get yourself a good system with a case and power supply big enough to expand into the future!

MOTHERBOARDS. THE VERY BEST ARE MUCH BETTER.

It's hard to believe something with the word "mother" in it could be anything but wholesome and wonderful. Unfortunately, not all motherboards are created equal. As an example, just because a board has a '386 processor running at 25 MHz does not mean it's like all the other 25 MHz '386 boards. Far from it.

First off, you can start with the quality of the bare fiberglass board. It can vary significantly. All kinds of grades of fiberglass can be used to make it. Even the best electronic design implemented on a cheap printed circuit board can be a disaster.

Here's another inside scoop. Many motherboards are made from off the shelf designs provided by the manufacturers of chip sets. These designs are intended to encourage the use of their chips and provide a basis for further board design and enhancement. Unfortunately these canned designs are frequently implemented "as is." These "canned" boards offer nothing in the way of advanced design and in fact carry many performance compromises.

As a result, thousands of

mediocre motherboards flood the market and are slapped into systems. They're sold, often at seemingly low prices, to the unsuspecting. Don't get us wrong, they often will work, at least for awhile. But they're fraught with compromises. How?

Beyond the lack of advanced features, the board quality is often less than desirable. Few precautions are made particularly in the areas of signal buffering, on board noise suppression, EMI emissions and the like. Unfortunately, most of the compromises may not be immediately noticeable to the consumer.

When it comes down to it, you're going to be very satisfied.

At ZEOS we use only the very best in motherboard components and designs. The boards are absolute top quality. As an example, our Editor's Choice 386SX motherboard is *eight layers* in thickness (ask the other guys about the thickness of their boards). And ZEOS buffers and filters the signal lines to achieve the quietest boards possible. Our boards are optimized to help our systems meet or exceed the stringent FCC Class B requirements for EMI emissions. And speaking of meeting requirements.

UNDERWRITERS LABORATORIES. ON EVERY ZEOS '386!

We can talk all we want about the electrical qualities of ZEOS systems but what can we say to prove it. How about UL listing? That's right, every ZEOS '386

system is Underwriters Laboratories listed. We're not talking about just one component (like the power supply). We're talking about the *entire system*. When you're shopping around, be sure to ask "Are your systems UL listed?"

THE BEST IS YET TO COME!

Because when you receive your new ZEOS system you'll appreciate all we have said and done. Rock Solid high performance systems, 24 Hour a Day Toll Free Technical Support, 30 Day Absolute Satisfaction Guarantee, Express Replacement Parts Policy, One Full Year Limited Warranty, optional on-site service, ZEOS BBS and the list goes on.

These are the reasons you'll want to buy from ZEOS. These reasons and the fact that with ZEOS, you'll fall in love with computing all over again.

Your Friends at ZEOS



**Call Toll Free Anytime
800-423-5891**

We hope this ad has been of service to you. If you would like more information on our products or would like to place an order, give us a call any time of the day or night Toll Free, 800-423-5891.

Additional copies of this ad are available free of charge. Please ask for reprints from your ZEOS salesperson.

Where We Stand

General George Armstrong Custer, in response to your comment "there are not too many Indians on the whole American Continent for the Seventh Cavalry," let me, Bloody Knife, and Boyer offer the following intelligence:

You've mentioned as we charge, they will scatter. This probably will not be the case, considering the strength of their chiefs. The Cheyenne tribes are certainly led by Two Moon, Little Horse and White Bull. The Ogallala Sioux are surely under Crazy Horse. Other Sioux chiefs we sighted are Spotted Eagle, Fast Bear, High Back Bone, Lame Deer and Fast Bull carry strong medicine. The leader of the Uncapapas is probably the greatest of all - Sitting Bull.

Table 1

Tribes	Lodges Seen	Warriors per Lodge	Total Warriors
Uncapapas			
Sans Arca	224		
Indaputa Band	85	4	896
Brule'	15	4	
Minneconjou	140	5	340
Ogallala	190	4	90
Blackfoot	240	4	560
Cuthead	35	4	760
Two Kettle	13	4	980
(TOTAL SIOUX)	8	3	140
Cheyenne Tribes	964.00	3	39
Arapaho Tribes	55		24
(TOTAL OTHER)	12	3	3,889
(TOTAL TRIBES)	67.00	2	165
	1,017.00	3.73	180
			3,998

ent sightings have
formed our previous
s. But now, the
s have grown. For
now, scores of
es have been
at Little Big
with the
d Arapaho.

count in
and
able
virs to
is
re
face

All in all, there are the Uncapapas, Sans Arca, Minneconjou, Ogallala, Blackfoot, and Arapaho, but they are extremely few. We were not able to see them. Sir, this is an unusually large camp for the Sioux. They never come out. If you are insisting on action, you might do as we have done this day, for you will not see them.

If WordPerfect® 5.1 were there, perhaps he could have seen how the tables would turn.

Custer believed attack and victory were practically synonymous terms. His own Indian scouts, however, seemed to have a better understanding of the numbers they were up against. If they could only have demonstrated it on WordPerfect® 5.1 tables, even an ego the size of Custer's might have taken notice.

In the time it took to mount up, Custer's scouts could easily have used WordPerfect 5.1 to make horse sense out of a senseless situation.

All they had to do was list the tribes they saw, decide how many warriors are usually to a tent, define their math formula and let WordPerfect calculate the rest.

It's too bad Custer never had a chance to see the power of WordPerfect 5.1 in action. Once armed with its efficient filing, quick spreadsheet retrieval, equation editor, flexible

graphics and extensive speller and thesaurus, who knows? "Retreat" could have finally been in his vocabulary.

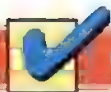
WordPerfect 5.1. Now that it's here, imagine the possibilities.

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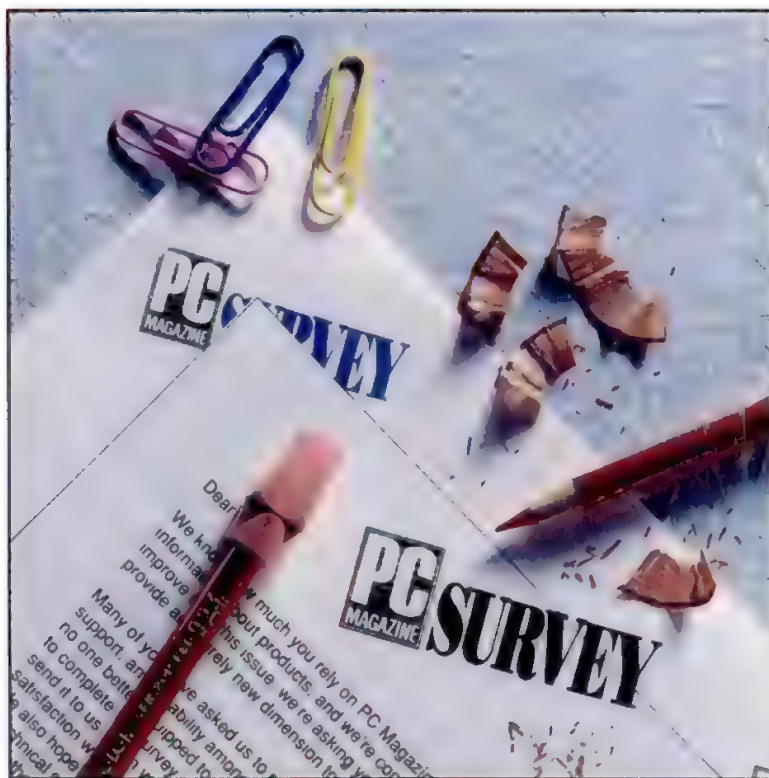
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COVER STORY

This special issue of *PC Magazine* focuses solely on service, support, and reliability. Back in March, we bound a survey into every copy of *PC Magazine*. It covered system units, monitors, video cards, hard disks, printers, and laptop computers. In our survey, we wanted to know about the machine right there in front of you—the one you use most every day. We were specifically not interested in your broad impressions of a dozen or a hundred machines for which you might be responsible. We asked specific ques-



PHOTOGRAPH PETER NEUMANN

SERVICE, SUPPORT, AND RELIABILITY AGENDA FOR THE NINETIES

tions, such as: "Did it ever break?" "Who fixed it?" "How good was the service?" "Did you ever need support?" "Was it adequate?" We also explored uncharted waters by asking you to examine the extent to which the equipment you're using satisfies your needs and how much longer it will continue to satisfy them.

R

eaders have asked us for years to include information on service, support, and reliability in our product reviews. Unfortunately, not even PC Labs can quantify reliability. So we decided to consult the best information base in the world: *PC Magazine* readers.

COVER STORY

Our results are based on nearly 20,000 respondents. In addition to the quantifiable ratings and responses, more than half the respondents supplied comments about their systems, and nearly 80 percent invited us to call and ask more questions. In the past several months, we've talked with hundreds of you to get more information. We've also talked at length to the manufacturers who were lauded or lambasted, to get their side of the story and provide full information to you.

The installed base of PCs in the United States is over 30 million. As many as 8 million new machines will have entered the market in 1990. As the installed base grows, the focus of the market must change from new technology to service. That's why we undertook this massive study to get your evaluation of the service, support, and reliability of your personal computer.

Not that interest has flagged in new technology, but the increasing size of the installed base creates inertia, making it more difficult for new products to displace old ones. This inertial effect is nothing new. We've researched software upgrades in the past, having asked the question, "How much better does a new version have to be before you'll undertake

the acquisition and training costs?" Our readers responded in two distinct groups: One said that the product had to be 40 to 60 percent better in perceived value, performance, and function. The other group said flatly that it had to be twice as good. Almost no one was interested in the 10 to 15 percent increases found in so many upgrades. Software users are looking for dramatic changes.

Interestingly, the big kick in hardware performance upgrades is increasingly hard to find. The incremental performance gain between today's machines and tomorrow's is nowhere near as great as that between yesterday's machines and today's. Therefore, purchasers are paying more attention to service-related issues. Buyers are looking for ways to judge manufacturers and their representatives on the ability to provide service over the long haul.

MACHRONE'S LAW

Hardware buyers face other decisions, too. The first is whether to buy up the technology curve or down the price curve. We can state this another way, which we'll call Machrone's Law (since I be-

lieve I said it first, back in 1986; other pundits are invited to disagree or claim earlier credit): The computer you want always costs \$5,000.

The original PC, sad little dual-floppy thing that it was, cost nearly \$5,000. The XT that replaced it cost roughly the same, replete with its 10MB hard disk and CGA graphics. The next watershed machine was the PC AT with a blazing 6-MHz 286—and a \$5,000 price tag. After that, Compaq bumped the curve a little bit by pricing the landmark Deskpro 386 at \$6,000. Today, you can have your choice of \$5,000 486 machines. This unending onslaught of new technology has depressed the price of the old landmark machines dramatically. The result is that there is only one mistake you can make in this market: doing nothing. You can always get better performance for your dollar by waiting, but the loss of productivity by not computerizing is doubtless more expensive than the money saved or the performance gained. We all have an eccentric uncle in the family who is waiting until they perfect a technology (color TVs, VCRs, microwave ovens, and so on) before he buys in. The rest of us embrace it, warts and all. We're willing to undergo the service and support hassles and put up



HEAD TO HEAD: PRODUCTS COMPETE ON SERVICE AND RELIABILITY

Graphics adapters are rated the most reliable product in our survey, and their manufacturers take high honors for the most satisfying repair service. It's no wonder, since repairing a faulty adapter usually means replacing the entire board rather than identifying and correcting individual failed parts.

Portables appear to cause the survey participants the most distress: they rate lowest on reliability, tech support, and repair service, and, not surprisingly, have a buy-again score (77) only a couple of points higher than bottom-scoring hard disks (75). The

unexpected winner in the buy-again competition is monitors. The percentage of those who would buy again from the same monitor manufacturer is a full 11 points above the score for hard disks.

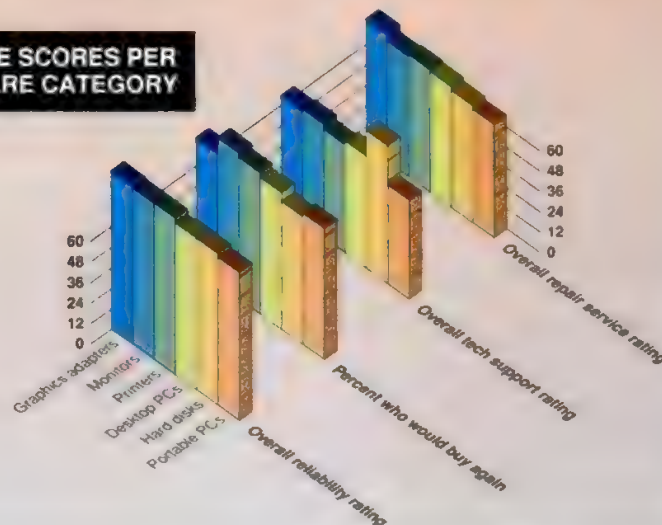
Desktop PCs and hard disks score the same in overall reliability (89), yet buyers are more likely to buy the same brand of PC again than the same brand of hard disk (80 versus 75 percent). The survey results indicate that dissatisfaction with hard disk repairs may be the underlying cause.

This 3-D bar chart gives you the chance to compare at a glance the average scores for four questions for the six hardware categories in our survey:

- How would you rate the product for overall reliability?
- Would you buy a product from the same manufacturer again?
- How satisfied were you with the technical support you received?
- How satisfied were you with the repair service you received?

The first question and the last two call on respondents to give a rated response based on a scale of 1 to 5, which we converted to a more familiar 1 to 100. For the second question, though, each result indicates the percentage of respondents who answer yes. Note that answers to the first two questions come from all those responding for a given company. For the last two questions, however, those answering are a subset of the total respondents—only those persons who tried tech support or had a repair problem.

AVERAGE SCORES PER HARDWARE CATEGORY



COVER STORY

with less-than-perfect reliability in order to gain the benefits the technology has to offer.

We look at ourselves as the risk takers, but the risks taken by the manufacturers are far larger. Even the smaller manufacturers have a tremendous potential liability in the number of machines that may require service and support. They may be putting 50,000 or 100,000 new machines out there each year. The exposure of the big manufacturers is truly daunting: they may sell a million or more machines a year. So a manufacturer's installed base forces the company to grow in order to provide adequate support or divert the business to a third-party specialist. Manufacturers who sell their products through dealers have to train them and build adequate feedback mechanisms to judge customer satisfaction.

The intertwined issues of service, support, and reliability are complex. There is no way to measure a product's inherent reliability beyond the essentially meaningless mean-time-between-failure (MTBF) numbers cited by the component manufacturers. After all, can you really tell the difference between a disk drive rated at 30,000 hours MTBF and one with a 50,000-hour rating? When all the components are brought together inside a PC or a printer, weird and wonderful things happen. Software gets into the act. Control programs, personality modules, and BIOS software interact with user programs. The seemingly impossible glitch becomes an all-too-possible nightmare. These details are supposedly worked out before the product is shipped to customers, but no testing program is as demanding or far-reaching as a user's day-in, day-out routine. As the saying goes, nothing is foolproof, because fools are so ingenious.

VALID CRITICISM

For years people have depended on the PC Magazine Labs-based comparison reviews. Even those of you who disagree with our conclusions or recommendations appreciate the testing criteria and benchmark test results as you use them in your own deliberations. Hands-on comparison reviews have been the one sure way to cut through the hype and rumor and get to the real issues, but some of you have always wanted more. Any comparison review in *PC Magazine* is the result of months of planning, benchmark testing, step-by-step procedural scripts, and side-by-side evaluations. But no comparison

review can simulate extended experience with the product. No product is born with reliability statistics, and no review of a new product that purports to represent reliability or level of service can be considered realistic or representative.

That's why we instituted our long-term testing program: *PC Magazine* Endurance Tests. In them, we live with a product for many months, much as any user would. We set aside our desktop machine, our monitor, even our favorite word processor to immerse ourselves in the product in question. In the nine months since we've instituted the Endurance Tests, we've gotten some valuable insights and rethought our opinions of some products. But there's a problem: the Endurance Tests examine only one sample of a product. Most of the time, it's representative. But we've wound up with lemons, too. Other times, it seems as if we've gotten the only good instance of a product, and everyone else is having problems.

The only way to overcome the Endurance Tests' inherent shortcoming is to take the issue to the segment of the installed base that's most heavily involved with evaluation and support: the *PC Magazine* reader. Until now, the quality of support has come down to conflicting claims and conjecture. This issue of *PC Magazine* provides a tool with which to judge the installed base.

CHOICE, NOT COMMODITY

We'd be the last people to say that PCs have become commodities. The range of options available to buyers is wider than ever. You have the ability to tailor a machine to your exact needs, and *PC Magazine's* comparative performance evaluations are geared to just that end. Service and support are additional factors in selecting the machine that's right for you, and this issue is a guide to your fellow readers' satisfaction with the service and support they have been getting on their hardware.

You can buy virtually anything, but not all combinations are available from all manufacturers. Some support the dealer channel strongly; others specialize in third-party support. As you consider future acquisitions, or supporting the existing installed base, give careful consideration to the kind of service that's available. The comments we quote in the sections that follow deal directly with users' satisfac-

tion with the service they've gotten and where they got it from. The reliability of a machine is what the manufacturer makes of it—you have little to do with it. Your satisfaction with service and support, however, is half your responsibility.

TO-DO LIST

This special issue raises some philosophical questions, too. Is this a report card or a to-do list? One clunker in a manufacturer's model line can pull down its overall score, but that's no indicator of future models' reliability. Conversely, low sup-

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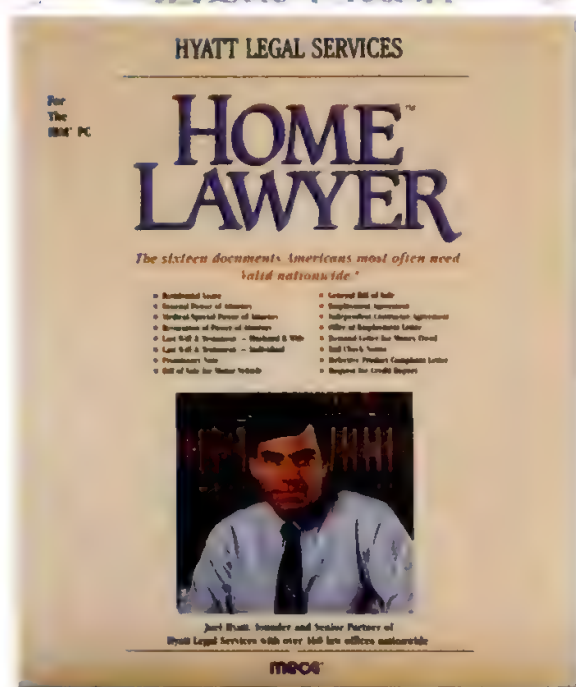
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LEGAL PEACE OF MIND



Does your babysitter have the power to authorize emergency medical treatment for your child? Do you "get it in writing" before engaging in those "routine" transactions that can be packed full of surprises? Do you have a current will? (A surprising 7 out of 10 Americans don't.)

Rest assured. Home Lawyer™ lets you prepare important personal documents like a medical power of attorney, an independent contractor agreement or a bill of sale to protect you and your family. It brings you the 16 documents Americans most often need -- created by Hyatt Legal Services for your home use.

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- General Power of Attorney
- Medical/Special Power of Attorney
- Revocation of Power of Attorney
- Last Will & Testament - Husband & Wife
- Last Will & Testament - Individual
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- General Bill of Sale
- Employment Agreement
- Independent Contractor Agreement
- Offer of Employment Letter
- Demand Letter for Money Owed
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SERVICE AND RELIABILITY

COVER STORY

port or reliability scores across a manufacturer's lineup may tell you something. Our goal is not to savage any manufacturer, but to provide a guide to the various distribution channels' ability to satisfy user needs. It would be atypical for *PC Magazine* to retreat from publishing its findings, so the report card aspect of this issue is here in full force, complete with pithy comments and many anecdotes.

We'd like you to view the areas where we've found deficiencies as a to-do list for the industry, however. Despite the enormous burden of support, as manufacturers gain success with their products, there's virtually no obstacle that can't be overcome with proper attention and effort.

The sections that follow address system units, monitors, video cards, hard disks, printers, and laptop computers. They cover some of the most volatile areas of PC performance and reliability. If you want to see more studies like this, let us know. The wild and woolly world of software lurks out there, as do connectivity and other areas that may interest you. Do you want this study to be an annual event? The choice is yours. ■



METHODOLOGY

PC Magazine's Service

and Reliability Survey was conducted by the research firm of Willard & Shullman, under the direction of the Ziff-Davis Research Department. The questionnaire was bound into each of 700,600 copies of the March 27, 1990, issue. By May 7, 18,673 subscribers and newsstand buyers had returned completed questionnaires to us. Note that the results of this poll represent the opinions of the *PC Magazine* subscribers and newsstand buyers who have responded to the questionnaire and are not projectable to all *PC Magazine* readers.



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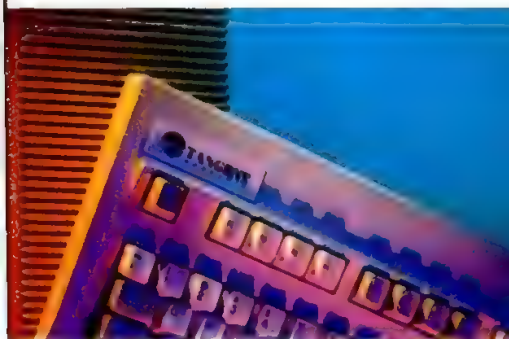
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CIRCLE 391 ON READER SERVICE CARD

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A READERS' GUIDE TO THIS ISSUE

Never before has such an exhaustive study of service, support, and reliability in the PC industry been undertaken. Not by us. Not by anyone.

Nearly 20,000 of you filled out the questionnaires that came with your copy of our March 27, 1990, issue. Your answers generated about 1.5 million numbers. And 70 companies garnered enough responses from you to warrant our reviewing them.

We've worked long and hard to analyze the results of this massive survey and to present them to you in the most comprehensive and accessible way possible. That's why we've devoted the whole features section of this issue to the study. Naturally, it doesn't look like any other issue of *PC Magazine*.

OVERALL STRUCTURE

The first thing you'll notice is that the issue has six sections that parallel those in the March 27 survey. Each covers the survey results on companies in a particular category of hardware: desktop PCs, monitors, graphics adapters, printers, hard disks, and portables. Each section has its own introduction, written by the *PC Magazine* editor in charge of that section. Reviews follow, most written by staff members and organized alphabetically by vendor's name. Each section also includes a 2-D bar chart that shows the size of the respondent base for each company and a 3-D bar chart that shows how each company fared on the four most impor-

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BY
MARY
KATHLEEN
FLYNN
AND
PAUL B. ROSS

tant questions on our survey. The numbers in the 3-D chart also appear in the company score boxes.

COMPANY SCORE BOXES

For each company whose products were mentioned in 75 or more survey responses, you'll find a company score box at the beginning of the review. (For companies whose products received fewer than 75 responses, the scores are more prone to bias, so we've chosen not to print them.) The score box shows how well each company did on the four survey questions we consider the most significant: overall reliability, percentage of respondents who would buy again from the same manufacturer, satisfaction with technical support, and satisfaction with repair service.

For each question, the company score is the average of all the ratings of that company's products, regardless of how many responses any one product received. If a vendor, for example, received 85 responses, 35 for one product and 50 for another, its

eaders cruising through this special issue won't need a special map to reach their key destinations. The table of contents and the usual guideposts will suffice. But for those who want to study the landscape more closely, here's a mini-Michelin to *PC Magazine's* Service and Reliability Survey.

company score would be an average of the 85 ratings. The 19 questions of the survey produced a vast amount of company- and product-specific data. The company score boxes will give you a handle on the main results.

PRODUCT SCORE BOXES

For many companies, you'll see product score boxes for specific products (the Compaq Deskpro 386, for example) or product lines (Compaq's 386 models). This is because that vendor's product (or product line) received at least 75 responses, making its scores relatively reliable. We've gone to the greatest level of detail we could, as long as the 75-respondent base restriction permitted. Using the same questions as in the company score box, we've shown you how the product (or product line) fared on our survey.

THE FOUR QUESTIONS

The four survey questions reproduced in each score box (paraphrased, in part) are:

✓How would you rate the product for overall reliability?

✓Would you buy a product from the same manufacturer again?

✓How satisfied were you with the technical support you received?

✓How satisfied were you with the repair service you received?

To provide you with a context for interpreting the numbers in the score box, we plot three items for each question: the range, the actual score, and the average score.

✓The **range** is simply the spread between the highest and the lowest scores. For company score boxes, *high* and *low* pertain to the best- and worst-performing companies; for product score boxes, the range is defined by the high and low ratings earned by products in the same category, such as all 386-based PCs. The tinted area in the bar plot in each score box indicates the range.

✓The **actual score** is the result attributable to a given company, one of its products, or one of its product lines. It's printed in a colored box next to each bar plot, and its icon is a downward-pointing triangle of the same color.

READERS' GUIDE

✓An upward-pointing triangle marks the **average score**. The average score for companies is the mean of all company scores. The average score for products and product lines is the mean of all product or category scores.

The upshot is that, for example, IBM's performance (actual score) is judged against the average for all PCs, whereas the performance of its PC AT is compared with the average score for all 286-based machines.

UNDERSTANDING THE SCORES

Three of the questions in the score boxes call on respondents to give a rated response based on a scale of 1 to 5, which we have converted to a more familiar 1 to 100. For the "would you buy again" question, however, the result is the actual percentage of those who answered yes.

Scores for the first two questions in the score boxes are based on all responses for a given company or product. The satisfaction with tech support and repair service scores, on the other hand, are based on a subset of all responses: only those participants who had occasion to use tech support and repair service rated these services. Furthermore, these ratings are based on support and service regardless of who provided them. Where there was a significant difference between the quality of support and service from a particular provider (for example, directly from the manufacturer itself) and all providers, we've noted this in the reviews. Because so much of the repair service given in the PC industry is handled by third-party service providers, we've included an article on them in this issue; see "Third-Party Service: From Warranty to Eternity."

Our interpretations of the numbers follow guidelines from the Ziff-Davis Publish-

ing Co. Research Department: scores that are fewer than 4 points apart are considered comparable; scores from 4 to 9 points apart show noteworthy but not earth-shattering differences; scores that are 10 or more points apart indicate a significant difference.

Note: Survey scores should not be confused with grades. Depending on the category, a 75 may be an A plus, not a C. Compare the company's individual score with the actual range of responses and with the average. Remember, too, that average does *not* mean mediocre. If a company per-

forms in the average range, it's a healthy sign.

ANOMALOUS RESULTS

Because of the way the average scores and the high and low scores were calculated, some of the graphs show anomalous results, such as an average score lower than the low score defining the range. How could the average fall outside the range? Recall that the range is defined by high and low scores of products with a minimum of 75 responses. But the average is determined by all product and product-line scores linked to a given

company, regardless of whether there were 75 responses or not. In some cases the models with fewer than 75 responses shifted the average scores enough for them to fall outside or at the very limits of the range.

The payback for the few unusual numbers is company scores that reflect the widest selection of responses and product scores that are reliable because their base is above the minimum acceptable size.

BEYOND THE SCORE BOXES

Of course, the numbers in the score boxes aren't the only results from our survey. Other scores and percentages are

THE SCORE BOXES, LINE BY LINE

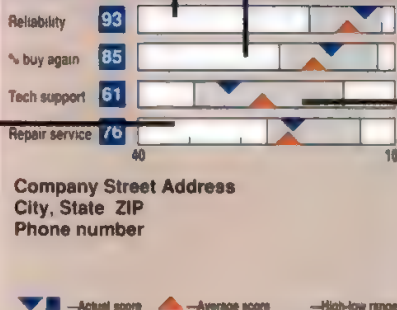
These ratings are based on the question "How would you rate the product for overall reliability?" The base of respondents is all those surveys that identify the company, or, in the case of a product score box, identify the product category.

These scores are based on the question "Would you buy a product from the same manufacturer?" Whereas the results for the other three questions are ratings (based on a scale from 1 to 5 in the questionnaire and a 1 to 100 scale here), the score for this question is the percentage of all those who said yes.

These ratings are based on the question "How satisfied were you with the repair service?" where the base of respondents is all those who requested repair service.

These ratings are based on the question "How satisfied were you with technical support?" where the base of respondents is all those who contacted technical support.

COMPANY SCORES



Company Name

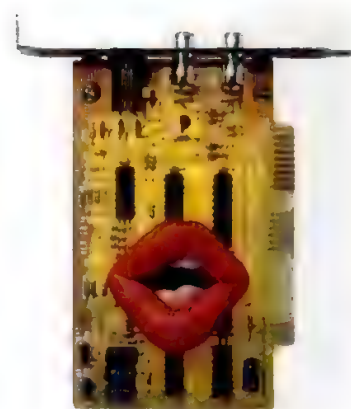
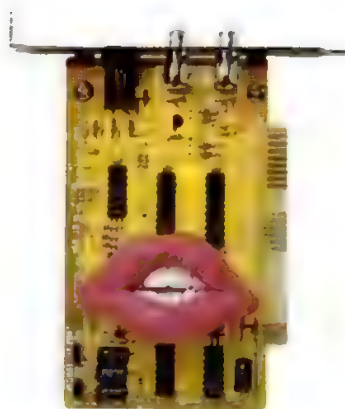
Product or Product Line



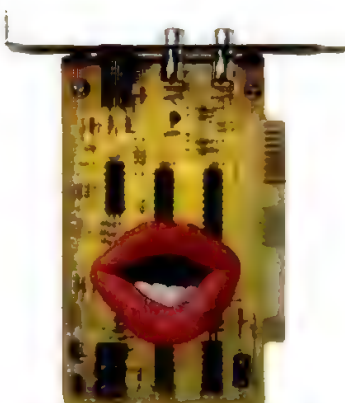
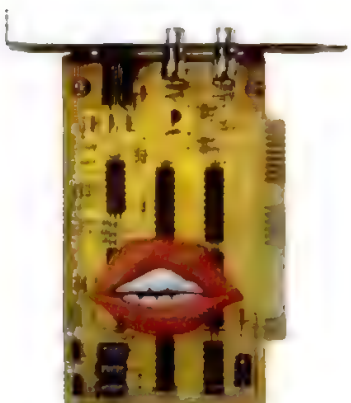
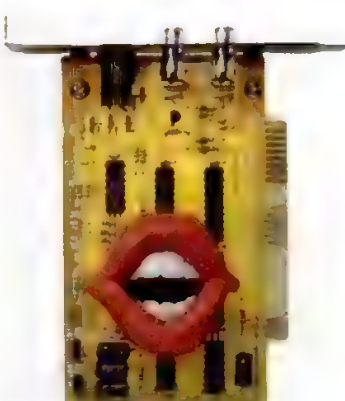
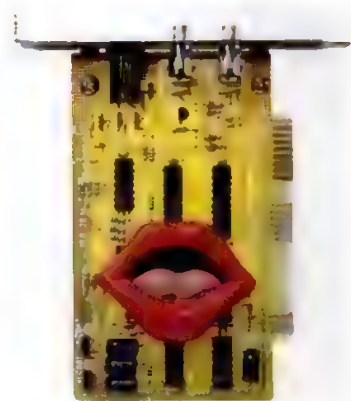
The **average score** is indicated by an upward-pointing triangle. For company score boxes, this is the average of all company scores. For product score boxes, this is the average of all scores for a given product category (386-based systems, for example).

The **range** of high and low scores is marked by a tint within the bar plot. In a company score box the range is defined by the high and low company scores. In a product score box it is defined by the high and low product scores. Only companies with at least 75 responses are included.

In a company score box, the downward-pointing triangle marks the **actual score of a company**, calculated as the average of all responses for all of a company's products. In a product score box, this is the **actual score of a product**, calculated as the average of all the responses for a particular model. Note that the actual score is printed here in a box the same color as the triangle.



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READERS' GUIDE

reported throughout the reviews: for example, the percentage of respondents who experienced a problem within the last year. Where that number was higher or lower than average, we publish the finding in the review. At a greater level of detail, when the survey results yielded any significant trends in the nature of the problem—a higher percentage of participants complaining of power supply problems, for example—we report that as well. Each review investigates the most significant findings.

Our questionnaire sought to develop the background necessary for responsible interpretation of the ratings. To get a sense of how much wear and tear the equipment being rated had endured, for instance, we asked whether the item was new or used when the respondent began using it and how long it had been in use. We also asked whether survey

participants were responsible for deciding on the specific manufacturer or model of their equipment, whether the item meets their needs, and if so how much longer they expect to keep it. The insight from this data is woven into the fabric of the reviews.

TALES FROM THE INSTALLED BASE

Numbers tell only part of the story. After poring over the 1.5 million pieces of survey data (with considerable assistance from Ziff-Davis's research department) and perusing the more than ten thousand notes scribbled on questionnaires (with help from our receptionists, secretaries, editorial assistants, and starving-actor friends), we began phoning hundreds of participants for follow-up interviews. Your stories of competence and in-

competence, frustration and satisfaction, irritation and joy were by far the most interesting part of putting this issue together. The excerpts we've chosen to include in the reviews reflect the trends we found in the numbers, add to them, and explain them.

THE VENDOR'S SIDE

As always, we stayed in close contact with the vendors we reviewed. Although often unprepared for our onslaught of service-related questions, they kept us up to date on their latest policies and strategies. Turn to the features table to see what service and support comes standard with equipment from each vendor. The table focuses on the services provided by the manufacturer; other services may be had from third-party providers.

Where our findings were

negative, we solicited responses from the vendor—a standard part of our review process for all articles. We've included the vendors' responses in the company write-ups.

REVIEW CRITERIA

To be included in this issue, a company had to meet one of two criteria: at least 75 *PC Magazine* survey respondents had to rate the company, or *PC Magazine* editors had to consider the company significant enough to include the anecdotal information without relying on hard numbers. Although there were lots of companies we wanted to add, we were limited by space considerations. The PC section, for example, includes 27 companies that got 75 or more responses; so even though we were curious to see how you rated some of the companies that got fewer responses, the section was too large to add them. ■

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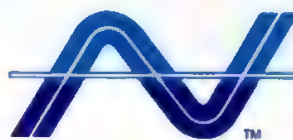
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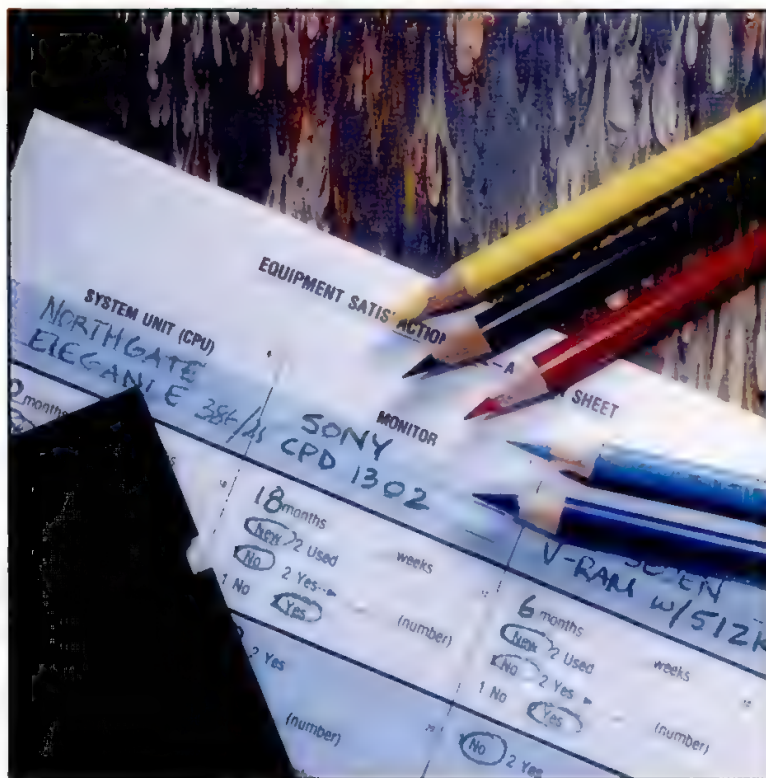
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COVER STORY

If Charles Dickens could turn our survey results for PCs into a novel, it would be called *Low Expectations*. And if Stanley Kubrick made the movie, the subtitle might be "How I Learned to Stop Wor-rying and Love the Bad Service." Be-cause even though nearly half of our survey participants reported problems with their PCs, they gave the machines high marks for reliability. And despite giving low scores to support and service, most said they'd go back to the same vendor for more of the same treatment.



PHOTOGRAPH: PETER NEUMANN

DESKTOP PCs

THE LONG ROAD TO RELIABILITY

Nearly 18,000 readers filled out the personal computer section of the *PC Magazine Service and Reliability Survey*, which was bound into our March 27, 1990, issue. More than 40 percent of them reported experiencing a problem with their PCs during the previous year—higher than for the other equip-

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BY
MARY
KATHLEEN
FLYNN

espite problem-ridden PCs, poor tech support, and inadequate repair service, survey participants say that they're willing to give vendors another chance. But mail-order houses offering toll-free tech support and free on-site service may lure these loyal customers away.

DESKTOP PCs

ment on our survey. The second-highest incidence of problems was for portable PCs, where 34 percent of the respondents reported a problem. The lowest was for graphics adapters, where only 11 percent indicated a problem.

PLETHORA OF PROBLEMS

With such a high incidence of problems, you'd think respondents would have judged the overall reliability of their PCs harshly. Instead, the opposite was true: participants gave very high marks to the machines. On average, respondents gave their PCs a reliability rating of 89 (out of a possible 100). More than 70 percent of the survey participants gave their PCs the highest score, and nearly 20 gave their systems the second-highest score.

Satisfaction with tech support and repair service, however, was much lower. Respondents rated technical support at 66 on average and satisfaction with repair service at 75 on average. Only 61 percent of the respondents gave tech support one of the top two scores. Repair service ranked a little higher, with 72 percent of the respondents giving it one of the two highest scores.

Despite broken machines, information that was hard to come by, and repairs that took up precious time, respondents said they'd give their manufacturers another chance. When asked if they would buy again from the same vendor, 80 percent of them answered yes.

But telling us they were willing to buy from the same company again and actually doing it are two different stories. During follow-up interviews in June and July, many of the survey participants who'd indicated they would buy again from the same vendor reported that they'd already bought another make. And the clear trend in their buying decisions was to go mail-order.

MAIL-ORDER MANIA

The mail-order companies cleaned up on our survey. For overall performance across all survey questions, the top three companies were all mail-order houses: Dell, Northgate, and Swan. Swan (formerly called Tussey) got first-place honors in three of the four survey questions we consider paramount: percentage of respondents who would buy again from the same manufacturer, satisfaction with technical support, and quality of repair service. Dell and Northgate did almost as well.

When we asked survey participants

why they were so pleased with the mail-order companies, the resounding answer was service and support. Free on-site service and direct access to the companies through toll-free tech support lines were the benefits mentioned most often.

Swan got a few more percentage points on the buy-again question, but by all subjective measures Northgate was the hands-down winner when it came to customer loyalty. As we pored over the comments written on the questionnaires, we couldn't help but see the zeal for Northgate. As we interviewed participants for comments on other companies, they volunteered recent Northgate experiences, like getting replacement parts within 24 hours and getting tech support from Northgate chairman Art Lazere himself. And as we learned more about the company's service policies, it became clear that Northgate stops at nothing to please its customers.

One mail-order company that didn't

poorly on tech support and repair service. Only one company did worse on tech support, and only three companies got lower scores on repair service.

The cause of dissatisfaction with Compaq lies in the company's strict call-your-dealer approach. It leaves service and support solely in the hands of its distributors. If your dealer fails to satisfy you, you're out of luck, though you can always write a letter to Compaq.

According to Compaq spokesperson Mike Berman, the company's strategy is good for dealers because it lets them earn the profits service and support generate. Bill Waas, vice president of service for ComputerLand Corp., which has awarded Compaq its Service Vendor of the Year Award twice, concurs: "It's no secret that margins on equipment are dismal. The only way to make money in this business is to sell services." Waas applauds Compaq's relationship with its dealers: "Compaq has always been very cooperative to the dealer channel. It's always listened to our needs."

The mail-order companies really cleaned up on our survey. Swan got first-place honors. Dell and Northgate did almost as well.

do well was PC Brand, which got the worst score for overall reliability and the second-to-worst rating for satisfaction with repair service. PC Brand president Stephen Dukker attributes these failings to extremely rapid company growth and says the company has launched new programs to correct these problems.

One non-mail-order house that did very well on our survey was Hewlett-Packard. Participants gave HP a score of 96 for overall reliability, the highest score of all 27 PC vendors. With a score of 94, NEC came in second. HP also did well on customer loyalty: 92 percent of the respondents indicated they'd buy from HP again, second only to Swan. "HP may stand for high price," quipped one participant, "but it also stands for high performance." HP PCs emerged as high-performing, reliable machines—not surprising since our reviewers have likened them to tanks.

CALL YOUR DEALER

Compaq, the company with the second-largest share of the PC market, did very

But Compaq hasn't been listening to the needs of end users, according to survey participants. They told us tales of Compaq authorized dealers who went out of business, who stopped doing in-store repairs, or who simply didn't know what they were doing.

IBM, which also sells personal computers primarily through the dealer channel, fared better than Compaq. Big Blue got consistently middle-of-the-road results on just about every survey question. Making up nearly one-fifth of all survey respondents in this section, IBM's users helped determine the averages. Like the bulk of the PC vendors, IBM got high marks for reliability and customer loyalty, and lower ones for tech support and repair service. But IBM spokesperson Bill Amana says that "IBM's own survey data shows customer satisfaction with its dealers to be very high."

Coming in dead last on tech support and repair service was Commodore. We were pleased to discover that the company was aware of its poor performance on service and support and was revamp-

HEAD TO HEAD: COMPANIES COMPETE ON SERVICE AND RELIABILITY

Twenty-seven companies each garnered the 75 responses needed to be included in the PC section of our survey. Of all these, mail-order house Swan Technologies got first-place honors in three of the four categories we consider most important: percentage of respondents who would buy from the manufacturer again (93 percent), satisfaction with technical support (a score of 87), and satisfaction with repair service (87). The only footnote to this remarkably strong showing is that because the number of responses Swan received was low—94, compared with the average PC manufacturer sample base of 653—its scores represent a narrower base of user experience than those of companies with larger response bases.

Fellow mail-order companies Dell and Northgate also did exceptionally well. For technical support, Dell came in second, and Northgate came in third. For repair service, the order was reversed: Northgate came in second, and Dell came in third. For percentage of respondents who would buy from the same company again, Dell tied for third, and Northgate tied for the next place. When it came to overall reliability, Dell did respectably, placing third with five other companies; Northgate did less well—it and four other compa-

nies tied for seventh place.

For reliability, Hewlett-Packard received the highest score, 96, and NEC came in second with a score of 94. HP came in second for repeat customers: 92 percent of respondents indicated they'd buy again. In the other categories, NEC's scores landed in the middle.

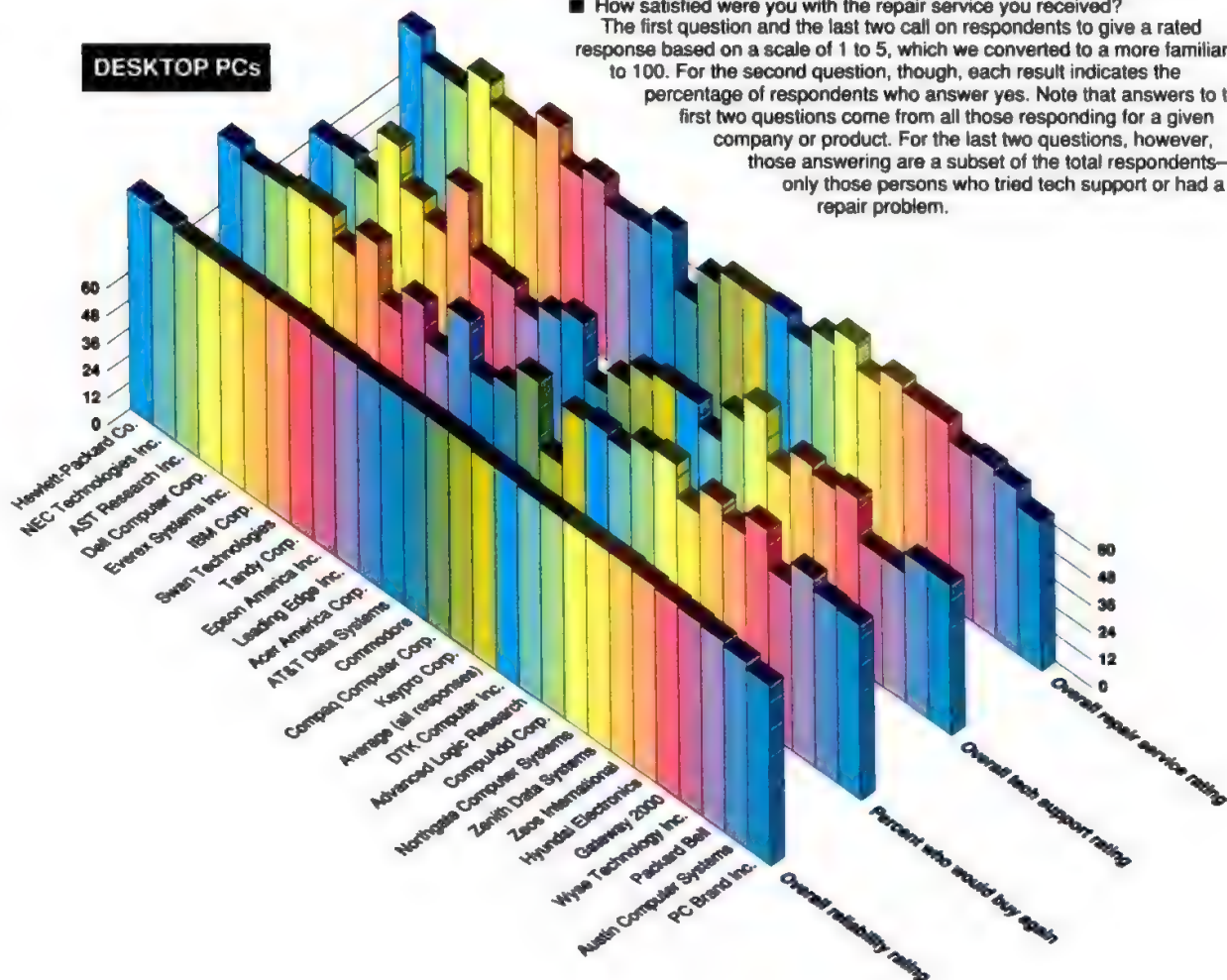
IBM did respectably though not outstandingly well across the board. Compaq did fine on reliability and percentage of participants who'd return to the company for another purchase but on tech support only one company did worse: Commodore. And on repair service, Compaq tied with Acer for fourth from the bottom.

Kaypro hit bedrock when it came to repeat customers—survey participants expressed uncertainty about the company's future. In addition to coming in last on tech support, Commodore was dead last on repair service. But like top-rated Swan, Commodore, Kaypro, and PC Brand received fewer responses than other companies—83 for Commodore, 123 for Kaypro, and 146 for PC Brand—which may skew these extreme scores.

This 3-D bar chart gives you the chance to compare at a glance the company scores for four questions:

- How would you rate the product for overall reliability?
- Would you buy a product from the same manufacturer again?
- How satisfied were you with the technical support you received?
- How satisfied were you with the repair service you received?

The first question and the last two call on respondents to give a rated response based on a scale of 1 to 5, which we converted to a more familiar 1 to 100. For the second question, though, each result indicates the percentage of respondents who answer yes. Note that answers to the first two questions come from all those responding for a given company or product. For the last two questions, however, those answering are a subset of the total respondents—only those persons who tried tech support or had a repair problem.



DESKTOP PCs

ing its programs as we went to press.

Kaypro did the absolute worst when it came to repeat customers. Survey participants expressed uncertainty about the company's future—fearing in particular that it might not have a future. But newly appointed president and CEO Ben Fisher assured us that Kaypro is turning itself around.

USAGE TRENDS

The survey results confirmed many of the usage trends we've written about in these pages.

Of the 17,981 survey responses we received on PCs, the largest number of them concerned 286-based PCs: 5,883. But almost as many were on 386-based systems: 4,724. And it's clear that the new systems are 386s. About 60 percent of the 386s had been in use for a year or less, whereas only 23 percent of the 286s had been in use for under a year. And the respondents using 386s seemed more willing to become repeat customers: 84 percent said they'd buy again from the same company, compared with 81 percent for the 286 participants.

The smallest respondent base was for 386SX-based systems, which got 491 responses. A whopping 88 percent of the SX participants said they'd go back to the same manufacturer. Almost a third of these systems had been in use for six months or less. So far, they've been reliable: only 31 percent reported problems, compared with the 42 percent for the other processors.

We received 717 responses came in for 8086/8088-based systems. Of these, 45 percent had been in use for more than three years. Only 15 percent had been in use for a year or less. A low 74 percent of the 8086/8088 respondents said they'd buy again from the same vendor.

Machines based on the 486 chip did not generate enough responses to provide meaningful survey results.

Our survey also asked about buying responsibility. The respondents clearly had buying power: 83 percent said they were responsible for choosing their machines.

REVIEW CRITERIA

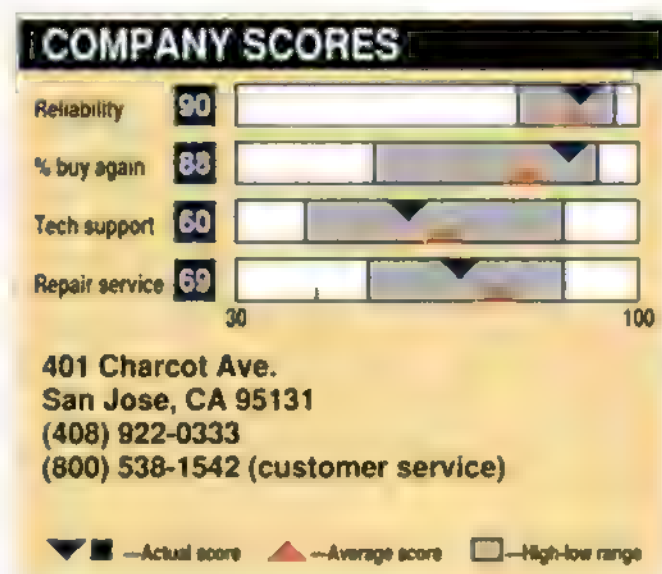
In order for the survey results to be considered reliable, a company had to garner at least 75 responses. 27 system unit vendors met this requirement, although we have data on many others.

Reviews of these 27 companies, based on survey results and follow-up inter-

views with participants and the vendors themselves, follow in alphabetical order. They tell a fascinating story punctuated by hope, frustration, anger, and endeavor. PCs will never be perfect, but some clear winners emerge in the quest.

Acer America Corp.

by Gretchen Luchsinger



Acer America is a large company with a low profile. Large? Well, huge, actually. It's part of the Acer Inc. empire, which is headquartered in Taiwan and includes Acer France, Acer Japan, Acer Germany, Acer Malaysia Through these subsidiaries and more, Acer has churned out more than 1.5 million PCs and not a few peripherals in a little over a decade. Its per annum growth rate has averaged 80 percent. Acer sells PCs in 75 countries, making it the largest OEM in the world.

But hard as it may seem to believe, Acer is not a name on everybody's lips—at least not in the United States. The com-

pany saturated markets in Europe and Asia before coming to the New World, and has only recently begun to exert its presence here.

386s, respectively). Survey respondents gave the company an average overall reliability rating of only 90. One positive sign was that the percentage of respondents who reported a problem was slightly lower than average—33 percent versus 41 percent. Another encouraging sign was that the severity rating of those problems was also only average. Even more important is the high percentage of respondents who would buy from Acer next time around: 88 percent compared with the average 80 percent. The two negative scores the company received were for satisfaction with technical support and repair service; the former got a score of 55, way below the average 67, and the latter got a 69 against the average of 75.

Survey participants relayed experiences that backed up these mixed scores. David Hoak, an engineer for tape back-up manufacturer Maynard Electronics in Casselberry, Florida, purchased an Acer 1100 for use in his lab over a year ago. He tries to keep a range of machines on hand for in-house experimentation, and had never worked on an Acer.

So far he's found performance and reliability good, despite a malfunction on the motherboard. But he says technical support is lacking. When he tried to add two megabytes of RAM—the machine had come with 2MB and room for two more—the machine refused to recognize the addition. He called Acer, from which Maynard had purchased the machine directly. "Their ideas and suggestions weren't of any help," Hoak recalled. "I decided to fix the machine myself."

A technician by trade, Hoak was able to get the 1100 up and running, and today says he is pleased with the machine. He considers the error a fluke, and doesn't expect it to reoccur on future Acer sys-

The percentage of respondents who reported a problem with Acer PCs was slightly lower than average.

tems if he decides to purchase them.

MIXED MESSAGES

Dr. Peter Rahko, an assistant professor of medicine at the University of Wisconsin Medical School in Madison, was satisfied with his Acer 900—until he discovered a 512-512 configuration on the 1,024K motherboard. Programs could draw only from one half at a time, which meant that those requiring more memory

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DESKTOP PCs

than 512K wouldn't run. Although he had purchased the machine from a local computer dealer, he turned first to Acer.

"The guy I talked to was perfectly straightforward in saying, 'This was a bad design,' and listing the options I had," Rahko commented. "Soon after I bought my machine they corrected the problem [in their newer systems]. I had to take mine to the retailer, and they upgraded my machine."

Rahko, who uses his PC in his research as a cardiologist, still has good things to say about his five-year-old system, which continues to plug away, trouble free. "I'd strongly consider [buying another]," he remarks. "I've been pleased with what I have."

PICK YOUR PROVIDER

Despite the accolades, Acer was aware of customer dissatisfaction with tech support before we contacted the company for this article. This spring, the company ended its toll-free technical support line, shifting the responsibility for support and repairs to its vast network of certified service centers and dealers, as well as to national, regional, and local third-party suppliers. "We view tech support from a perspective contrary to most hardware manufacturers," states Acer's director of product marketing, Olend King. "We allow the customers to decide who they want to act as the service provider."

Users who purchase Acer PCs receive a warranty disk, which they return to Acer with the name of their chosen service provider. They receive a one-year parts-and-labor guarantee, and four months of on-site service, which can be extended to 12 months or two years total for an extra charge.

When a customer brings in a machine with a problem, the reseller's service is followed up with a personal call from Acer. "We enforce good service by calling the end user," King contends. "We know the customer, we know the configuration. Only when the service call has been closed do we provide reimbursement to the service provider."

How this new program is affecting users is impossible to judge from our survey. How users will respond to the lack of a tech support line remains to be seen as well, although King added that Acer is considering the installation of a 900 number. Acer's new tech support and repair program may prove the solution to the company's problems, if, as King

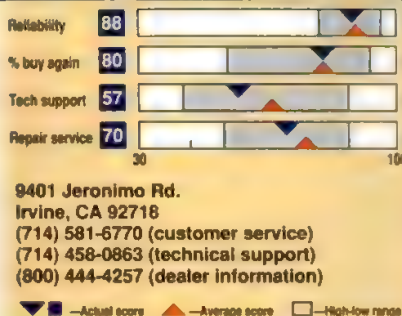
claims, it works on a system of checks and balances. But unless you have or intend to establish a solid relationship with a third-party or retail organization, or are technically inclined, you're sunk; don't expect to go running to Acer for help.

CIRCLE 804 ON READER SERVICE CARD

Advanced Logic Research

by Fredric Burke

COMPANY SCORES



Advanced Logic Research has built a reputation for being among the elite in terms of speed and technical sophistication. The company swings for the fences with every pitch, and nowhere is this more apparent than in its 1988 *PC Magazine* Award for Technical Excellence. By introducing the first 33-MHz 386 to the marketplace, ALR had staked itself a spot on the technical forefront.

But building fast machines is different from being able to service and support

Advanced Logic Research

80386 models



pared with the average 41 percent. And satisfaction with technical support was low; ALR got a score of 57, compared with the average score of 66 in this category. Satisfaction with repair service was lower than average, too: 70 compared with the average of 75.

BEWARE OF UNAUTHORIZED DEALERS

Because ALR does not sell directly to end users, the company prefers to depend on its dealers to provide support for its machines. Herein lie some difficulties, because dealers and service centers are not necessarily authorized by the factory. The best advice for ALR customers is to make sure you get an authorized dealer and an authorized service center.

Ben Marchak, technical service manager for ALR, says that while the company will get directly involved with end users, it prefers to handle those cases when the dealer is either absent or unable to resolve the problem satisfactorily. "Our emphasis goes to the dealer, though we do have an open door for end users. We're committed to making things work."

To that end, ALR is compiling a troubleshooting database and trains its own people to a high standard. In order for a dealer to become an authorized service

Building fast machines is different from being able to service and support them. The best advice for ALR customers is to make sure you get an authorized dealer and an authorized service center.

them satisfactorily. On our survey, ALR received an average overall reliability rating and an average percentage of respondents who would buy from ALR again—both good signs. But the percentage of participants who experienced a problem was higher with ALR than with other manufacturers—46 percent com-

center, its technicians must go to the factory for training and pass an exam.

Other end-user assistance includes basic end-user tech support, though not an 800 number. The company does offer a bulletin board, where technical bulletins, power tips, and other updates can be found. A year's parts and labor are standard fare,

DESKTOP PCs

and on-site service through Intel is also available. ALR also offers depot service and a 48-hour turnaround.

ADDING INSULT TO INJURY

But our survey indicates that this strategy doesn't always satisfy the customer. Survey participant Evan Nossoff, the public relations director for the California Museum of Science and Technology in Los Angeles, California, did not buy his machine from an authorized dealer. He uses his 386/20 tower to run InfoCommunications, a professional bulletin board for

public relations and related fields. While he complained about the high cost of ALR's proprietary RAM expansion board, he also found ALR's end-user support "poor and insulting." Part of this stems from his total dissatisfaction with the dealer he bought it from, where the problem was repeatedly misdiagnosed. Turning to ALR, he found that only after posing as a VAR consultant was he able to get the answers he needed. Other than that, he has been satisfied with his machine. His

verdict on ALR: "Technically all right, but losing sight of service."

One emerging thread throughout the survey and in talks with both a dealer and customers was that ALR would frequently take back a faulty machine, only to return it saying that it could not duplicate the problem. Stelios Touchtidis, the data processing director of Admarketing Inc. of Los Angeles, California, liked his machine's speed, but neither its reliability nor the service he received. "I spent most of my ownership of a 386/20 trying to get it fixed. When ALR sent the machine back saying they could find nothing wrong with it, my dealer upgraded me to a Flex-Cache free of charge. It worked well, but even then it had small fit and finish glitches."

ALR's unwillingness in some cases to make good its service commitments serves only to put its dealers in a bad position. Mike Ryher is the merchandise manager of Soft Warehouse, a computer retail chain based in Dallas, Texas. Soft Warehouse is both an authorized dealer and an authorized service center. He agreed with Touchtidis's complaints about some of ALR's service, but said, "It does happen that when ALR claims not to be able to replicate a problem, they claim there isn't one, even when the machine doesn't work when it comes back." Despite this, Ryher likes Advanced Logic Research. "They're in the business of building fast, inexpensive machines. They just need to be supported properly."

DEALERS' DELIGHT

Other ALR dealers were equally enthusiastic about ALR's machines. Hard Warehouse, also based in Dallas, is a direct competitor to Soft Warehouse. Bob Morris, service manager, is big on ALR. "We consider the ALR to be our high-end machine. We sell it like that, too, and add another two years to the basic warranty. While we're not an on-site service company, we will provide that service if the base is big enough." Technical hardware support is handled with factory-trained personnel and weekly update meetings; software support is less intensive. Like Soft Warehouse, Hard Warehouse is sometimes able to identify potential problems before the factory can. Most recently, a 200-machine installation required new serial ports; ALR paid for the work, while Hard Warehouse did it.

Jim Condrón, a sales representative with Business Machines Associates of

NUMBERS YOU CAN TRUST:
HOW MUCH IS ENOUGH?

Not surprisingly, IBM systems elicited more responses than any other product category from any other company in our survey: 3,188 *PC Magazine* readers completed questionnaires about Big Blue's PCs and PS/2s. That's nearly three times as many as second-place Compaq (1,079 responses). CompuAdd, Northgate, Dell, AST, and Tandy PCs were also well represented. The average sample base for a PC manufacturer was 653, and the smallest sample base that made it into the PC section of this issue was 83, for Commodore. All other PC manufacturer-

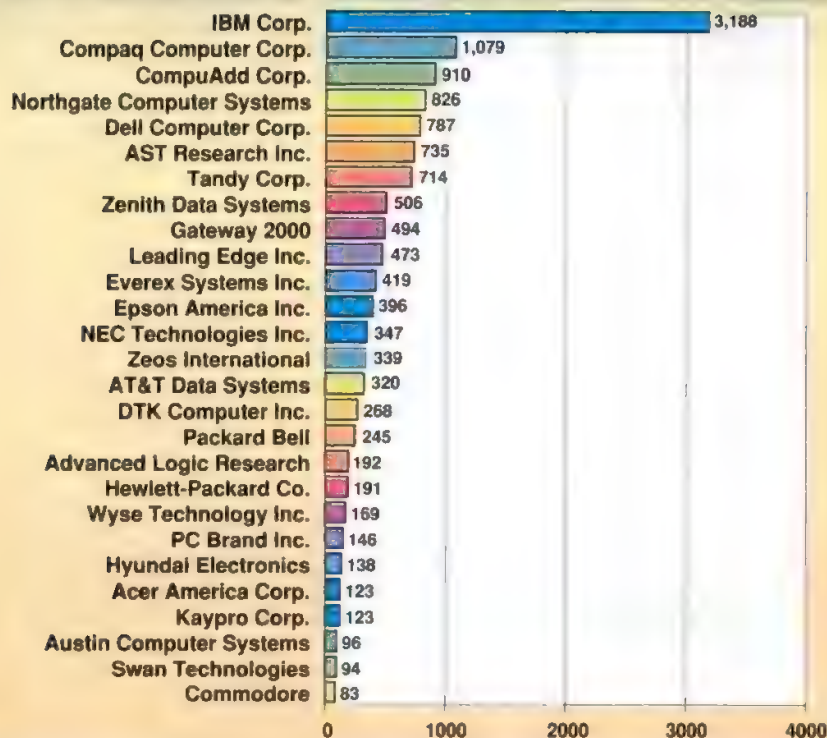
ers mentioned in completed questionnaires failed to meet this section's minimum requirement of 75 responses.

This chart displays the number of responses each desktop manufacturer received in our March 27 Service and Reliability Survey. In this issue, we review manufacturers that garnered 75 or more survey responses, the minimum number required for the results to be reliable. Where companies of special interest with fewer than 75 responses are reviewed, their ratings should be used with caution because of the small base sizes.

RESPONDENT BASE

PC MANUFACTURERS

NUMBER OF RESPONSES PER COMPANY



Buy IBM. Add CORE performance: 5-year warranty. Save \$17,000.

Recently *PC Magazine* and *Price Waterhouse* completed a long-term test series to see how LANs, UNIX based systems and minicomputers each performed running the same RealWorld™ set of accounting operations. Here's what they had to say:

"In this suite of multiuser accounting tests, the clear overall winner is the LAN, specifically (and surprisingly) the LAN powered by the 20-MHz IBM PS/2 Model 80 with its 32-bit Novell adapter and ultrafast Core ESDI hard disk."



The \$17,000 bungle.

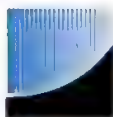
All other components of the LAN being identical, one could replace the venerable Model 80 (20MHz 386) Micro-channel & the CORE mass storage combo for a "faster" Compaq System Pro running a single 386/25.

Performance would drop about 20%, and the cost would be \$17,000 higher. Armed with this knowledge and the intelligence of sand, one could hardly recommend such a swap.

No drive is an island.

It was not simply the CORE drive that made the performance improvement. True, the drive is fast — knowing this, IBM chose our SCSI version to announce & demo their long-awaited SCSI Host Adapter.

The proprietary CORE controller also used in the accounting test is a true bus master, designed specifically to dramatically enhance the superior I/O capabilities already built into Micro Channel machines. And these I/O benefits extend to non-accounting applications like CAD, DTP, etc.



CORE
INTERNATIONAL



"...the special Core hard disk and controller helped the Model 80 [386/20MHz] to compete well with 25 MHz 486 and 33MHz 386 upstarts."

—F. Derfler and K. Thompson
PC MAGAZINE May 29, 1990

For once, more is more.

Considering LANs with 10 to 100+ users, the team of IBM's PS/2s and the CORE drive/controller mass storage solution is the prudent as well as performance choice. Here's why:

The "mini-killer" drive & controller used in the PW/PC Mag test was a CORE 310MB HC Series drive rated at 10MHz. Its companion CORE bus master controller could transfer data at up to 15MHz.

"Our recommended combination is the Core HC Series of hard disk drives and 15MHz controllers... Core provides a three-year full replacement warranty so you know they believe in their products."

— Frank Derfler, PC MAGAZINE

Nice as that is, we decided to push the envelope a bit faster. Actually, about 5,000,000 bits faster.

So in addition to our 10 and 15MHz drives we now proudly offer a new series rated at a screaming 20MHz.

That means data throughput as high as 2,000KB/sec. They're available in 310, 650 and 1,000MB with matching high-performance controllers.

And in SCSI as well as ESDI.

For AT-bus as well as Micro Channel.

150,000 hours

MTBF.

And the industry's first 5-year warranty.

Yep, 5-years, full-replacement.

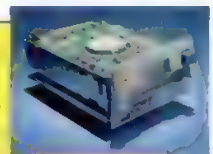
And IBM's on-site service is available. Contact your local dealer.

Or call CORE. After all, *IBM did.*



Free Tape Backup System.

In celebration of our 20MHz HC series, we're going to give you COREtape Light — 40-300MB backup at 4MB/minute and ideal for networks — FREE with every 20MHz HC Series drive and companion controller purchased between June 18 and September 30, 1990.



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CIRCLE 198 ON READER SERVICE CARD



intel Mother Board

DATA 386-25'
(super VGA, 100MB)
64K-cache 4MB RAM

\$3345

DATA386-33'
(super VGA, 100MB)
64K-cache 4MB RAM

\$3545

Includes:

Intel™ system board with Intel™ cpu.

- 64K cache.
- 4MB memory, expandable to 40MB.
- 80387 or **Weitek** coprocessor support.
- 16-bit, 512K VGA adapter (expandable to 1MB).
- Matsushita super VGA (14", 1024x768) (Optional: NEC Multisync 3D, 4D, 5D, or monochrome)
- **Conner** 100MB IDE hard drive. (Optional: 40MB, 80MB, 160MB, 200MB, 300MB)
- 1.2MB 5.25" and 3.5" 1.44MB floppy drives.
- 101-key enhanced keyboard. (Optional: 102-key)
- Two serial and one parallel port.
- 120MB or 500MB tape drives optional.
- Heavy-duty steel chassis. Room for five half-height drive devices. 200W power supply.
- LIM EMS 4.0 drivers included.
- FCC Class B Certification.
- Custom built to your spec.
- Free TRW on-site service for one full year.

DATA386-25E
(super VGA, 100MB)
4MB RAM

\$2945

A low cost 80386 non-cache model that offers affordable 32-bit processing power. Supports both the 80387 and 80387 coprocessors are provided, along with a wide range of disk drives and video components.

DATA 486ec-25
(super VGA, 100MB)
4MB RAM

\$4585

Full 80486 25 Mhz performance with a new low price! **WEITEK**™ 4167 support for even faster number crunching. With up to 8MB RAM on board (16MB total capacity), and a wide selection of superfast disk drives and video components, the DATA486-25 is geared to satisfy the most demanding power users.

Portacomp III 386-25

\$2955

For the power user, take along the new PORTACOMP III. This 80386-25 lunchbox portable with its VGA gas plasma display, full function keyboard and two full size expansion slots makes an ideal remote base.

- VGA gas plasma display (640 x 480) with 16 gray scales
- 80386-25 processor
- 1MB RAM standard, expandable to 8MB
- 3.5", 1.44MB internal and 5.25" 1.2MB external floppy drives.
- 40MB, 25ms **Conner** IDE hard drive (80MB, 100MB, 200MB drives optional)
- 1 parallel and 2 serial ports.
- 101-key keyboard with separate numeric and cursor keys
- 150W power supply (110/220V autoswitching)
- 2 full-length 16-bit ISA slots.
- Carrying case

(SX also available)



1-800-736-DATA

FOR THOSE WHO COUNT: 32 vs. 16

Take off and go anywhere with this true 80386-20 laptop. With the built-in battery, you can be productive on flights to Sydney, Stuttgart, Tel Aviv or Taipei. Travel with the super crisp VGA display (LCD) as your companion.

Test one on your next flight or your next presentation. If you are not completely satisfied, just return it within 30 days, no questions asked. We are just that confident!

Why buy a laptop computer if you can't carry it with you? You wouldn't buy a portable radio without a battery, so why settle for a portable computer without the most essential element of portability. And why sacrifice the honest-to-goodness 32-bit speed of a genuine 386 (as opposed to the 32-bit emulation employed by an SX machine). Now you don't have to! DATAWORLD introduces a bona fide 20Mhz 386 laptop with the battery built right in.

In addition to all of the standard features offered by the competition, the LP320 has an LCD/VGA screen, which offers a high contrast normal or reverse video display. Also, an advanced sleep mode feature prolongs the usable battery time per charge by letting the display, hard drive, and CPU hibernate when not active. That's better by far than the competition's touted perfect portable!

Now, at a price far lower than SX's with a battery; indeed, priced in the same range as battery-less SX laptops, you can own a real 386 (20Mhz) portable complete with battery. With DATAWORLD, you don't need to sacrifice speed requirements to get portability or affordability. Look around if you like, there just isn't anything to compete with this value.

DATA LP/320 laptop

- VGA backlit LCD display, 640x480 resolution with 16 shades of gray. Built-in VGA port supports external VGA monitor.
- 80386-20 processor, 80387 coprocessor support.
- 1MB base RAM, expandable to 8MB on board.
- 3.5" 1.44MB floppy drive (5.25" 1.2MB external drive optional).
- 4.3MB, 25ms IDE drive (80MB drive optional).
- 1 serial and 2 serial ports, 1.5m length expansion.
- Rechargeable battery with battery-level indicator light.



SHIPPING NOW!!
\$2595



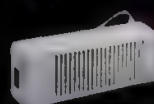
VGA monitor (optional)



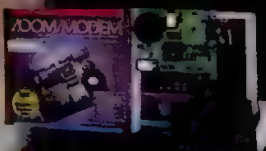
Mouse (optional)



Numeric 10-key pad (standard)



AC adapter (standard)



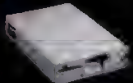
Modems/Network Cards (optional)



Math Coprocessor
Intel or IIT Math coprocessors (optional)



User Manual and FASTLIX (standard)



External 5.25" floppy drive (optional)



Carrying bag (standard)



External tape backup drive (optional)

INCREDIBLE TEST!
DATA 386-214
January 14, 1989

↑ RELIABILITY
↑ COMPATIBILITY
↑ PERFORMANCE



DATA386-25
MAY 30, 1989



DATA386-20
MAY 30, 1989



DATA386-16
FEB 28, 1989



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OCT 11, 1988

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XEROX

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And now there are several new ways to look at it. Because the desktop publisher that does more for you now does it all in the three leading PC environments.

The Gold Series introduces new Ventura Publisher® editions for DOS/GEM, Windows 3.0, and OS/2 Presentation Manager. That means new ease of use and learning as well as compatibility with hundreds more software applications. All three new editions can use documents from Ventura Publisher 1.1 and 2.0.

It does even more than before.

The Gold Series gives you much more than a choice of environments. At no extra cost, each edition includes our Professional

Extension and Network Server. So you also get such advanced DTP features as interactive table creation and scientific equation editing, cross referencing, and vertical justification.

And you get networking. So several users can edit and proofread simultaneously as well as share stylesheets and network resources. On Novell, IBM, 3COM, and other Windows- and OS/2 Presentation Manager-compatible networks.

Whether you're designing a newsletter or publishing a directory, you'll do it faster and more effectively with Ventura Publisher. Unique features give you more flexible and precise type control, and automate many

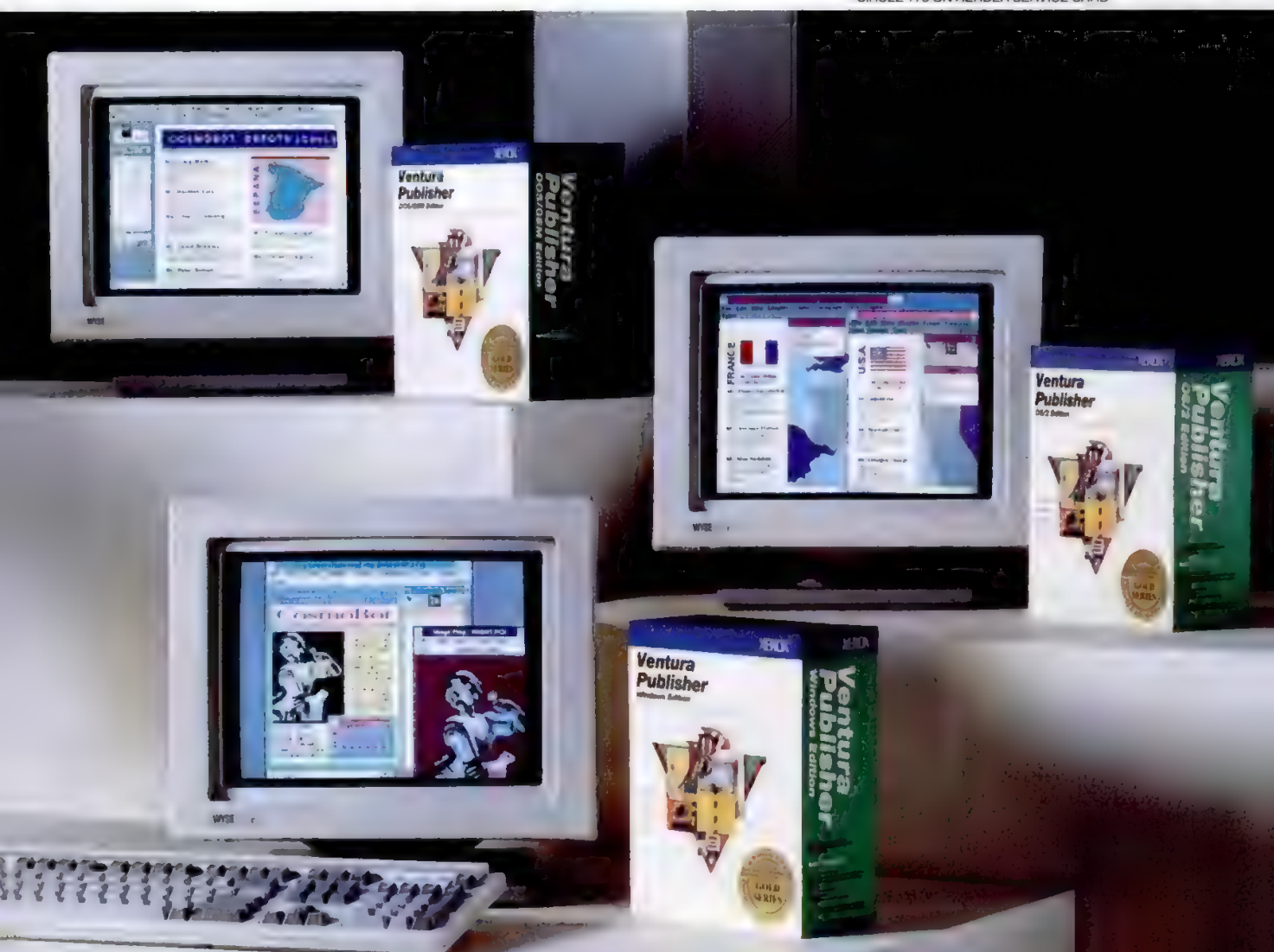
steps other programs make you repeat over and over. Ventura Publisher is the one DTP program that can handle all your publishing and design projects.

If you want to do more in desktop publishing, doesn't it make sense to use the program that does the most? Call today for more information about the new Ventura Publisher Gold Series. (800) 822-8221 in USA; (800) 228-8579 in Canada. For training information, call (800) 445-5554. Ventura Software Inc., a Xerox company.

Ventura Publisher Gold Series

It simply does more.

CIRCLE 175 ON READER SERVICE CARD



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Downers Grove, Illinois, has been working with ALR for two years. ALR is the dealer's best-selling line. According to Condrón, "They are machines for the connoisseur. Out of the box, they are among the fastest machines around. In their case, confidence breeds confidence." As for service, BMA is authorized as both a dealer and a service center.

ALR's most glaring weakness is its mix of authorized and nonauthorized dealers and service centers. The company must rid itself of that mix and refocus attention on better service at both the dealer and end-user levels. Only by doing that will ALR be able to defend its high ground.

CIRCLE 606 ON READER SERVICE CARD

AST Research Inc.

by Karen Best

COMPANY SCORES



16215 Alton Pkwy.
Irvine, CA 92718
(714) 727-4141
(714) 727-9630 (technical support)
(800) 876-4278 (sales)

Legend: Actual score (dark blue), Average score (orange), High-low range (light blue)

"I love my AST!" said survey participant Noahal Mundt, a software engineer for Harris Government Information Systems in Palm Bay, Florida.

"Overall, the AST Premium-286 Model 120 is a fine piece of equipment that encourages me to seek out their products," says survey respondent Anthony Kazarian, key account manager for Difco Laboratories in Wheeling, Illinois.

NOT DEAD YET?

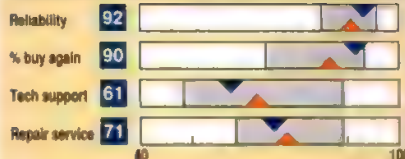
Most of AST's customers who responded to our survey agreed. AST's overall reliability rating of 92 was just above the average score of 89. But that comes as no surprise to us at *PC Magazine*: contributing editor Alfred Poor named the AST Premium/286 one of the best products of 1987 ("The Best of 1987 (And Some of the Worst)", January 12, 1988), saying, "Although 1987 may go down as The Year of the 386... it will not be The Year the 286 Died. That's due in large part to

SERVICE AND RELIABILITY

DESKTOP PCs

AST Research Inc.

80386 models



AST Premium/286



machines like the AST Premium/286." We also gave it an Editor's Choice award when we initially reviewed it ("10-MHz Computers: High Speed, Low Risk," April 28, 1987).

Another healthy sign was the low percentage of respondents who reported a problem: 37 percent, a bit below the average 41 percent for all PCs. AST did well on tech support and repair, too. Survey participants gave the company a score of 63 for satisfaction with technical support (roughly the same as the average score of 66) and 74 for satisfaction with repair service (essentially the same as the average score of 75).

Service for AST machines is handled by authorized resellers and service centers. AST doesn't have an 800 number but it does provide a 24-hour bulletin board system ((714) 727-4723), which is free to anyone with a PC and a modem. (You will have to pay your phone bill, of course.)

Despite AST's healthy scores on repair service, respondents interviewed for this article weren't always so satisfied with AST's dealers. Christine Rivera, president of MicroDynamics Plus in New York City, said, "I really like the AST machine. But if something goes wrong, and it did with my AST machines, forget it. It's a hassle to get them repaired because I have to go to a third party, an authorized service center. The two I went to didn't stock parts, and the turnaround time was very poor. I don't like dealing with a middleman. I'd rather deal directly with the company. I can't afford to waste so much time getting things fixed. If AST could invent a machine that never broke...."

CONFIGURE CAUTIOUSLY

Others complained about AST's proprietary Cupid-32 architecture. Tim Reid, systems manager for The Burke Group, in Honeoye Falls, New York, said of the AST 386-33 on his CFO's desk, "It seems to be a good machine. I guess you just have to be careful how you configure it, with this proprietary architecture and all. We've been having a compatibility problem between our AST 386-33 and a hard disk controller. We're not sure yet if it's a hardware or software conflict, since the controller has its own BIOS."

But despite the occasional complaint, AST did respectably on our survey. Perhaps the most telling statistic is the large pool of repeat customers: 89 percent of the respondents indicated that they would buy again from AST, compared with the 80 percent of all PC respondents who said they would buy again from their manufacturers.

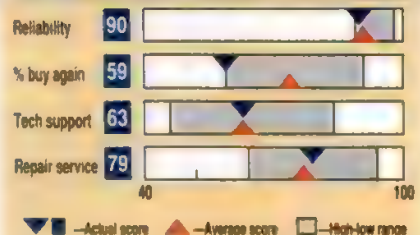
CIRCLE 606 ON READER SERVICE CARD

AT&T Data Systems

by Meredith Miranda Gadsby

AT&T Data Systems

8086/8088 models



AT&T is well known in the information systems industry for product quality and advanced technical support services. In our survey, the company got average scores in three of the four most important categories—overall reliability, satisfaction with technical support, and satisfaction with repair service—but did poorly in one critical area: repeat customers.

Only 67 percent of the AT&T survey participants indicated that they would buy another PC from the company—13 percent less than the average percentage of all PC respondents who would buy from their manufacturers again. PC 6300 owners who responded to the survey were even more emphatic about not returning to AT&T: only 59 percent said they'd go

DESKTOP PCs

back to AT&T, 15 percent less than the average for 8086/8088-based owners who answered our survey.

A high percentage of respondents reported a problem with AT&T's PCs: 46 percent, compared with 41 percent for the overall pool of respondents. And the severity of problems reported was high:

AT&T Data Systems

8086/8088 models



respondents rate the typical AT&T problem at 52—above the average 45 severity rating. But it's important to consider that the AT&T machines represented in the survey were older than PCs from other companies. Respondents had owned their AT&T machines an average of three years; the average age for all PCs was just under two years. The PC 6300 respondents had owned their machines even longer—close to four years, as compared with three years for 8086/8088-based systems from other companies.

Although the survey results don't yield concrete reasons for the low showing of customers who would buy from AT&T

to buy them. He would recommend the 6300 to anyone interested in that class of machine (8086). "It's not the prettiest or the fastest; it doesn't have all the bells and whistles that other machines have, but when I turn it on, it runs."

Happy as he is with his PC 6300, Briley won't be returning to AT&T when it comes time to buy another PC. "If I was going to go to a 386 system," he explained, "I can't see paying so much money for an AT&T when I can get a Zeos, for example, cheaper."

DIFFERENT VALUES

Other respondents, like David Smiley, owner of PC Systems Support in Virginia Beach, Virginia, were more impressed with AT&T's value. As a PC consultant, he sells the PC 6300 because he wants to "order quality merchandise" for his clients. Like Briley, Smiley was exposed to many different systems in a previous job. He selected the AT&T 6300 for his own use because it was the "best value for the money."

Dick Gundlach, who is in charge of media relations for AT&T, responded to complaints of poor price/performance by saying that customers are paying for quality and dependability when they buy from AT&T. "We don't just sell boxes. We sell quality, value, and reliability." Compared with Compaq, IBM, and other high-end

"My AT&T 6300 has been an all-around dependable machine. It's not the prettiest or the fastest; it doesn't have all the bells and whistles that the other machines have, but when I turn it on, it runs."

again, many participants complained of poor price/performance, lack of or late upgrades for DOS and BIOS, and incompatibility problems with IBM personal computers.

According to one respondent, Lloyd R. Briley, his AT&T 6300 has been "an all-around dependable machine." Briley, owner of L&L Enterprises of Clayton, California, previously worked in a computer store where he compared other systems with the 6300 and found it to be the most reliable. He has even urged his friends

companies, Gundlach said, AT&T's products are not overpriced. "In fact we're 5 percent to 20 percent less."

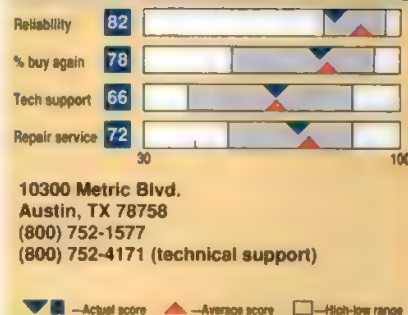
While Gundlach argues that customers are in fact getting an excellent value for their money when buying from AT&T, respondents to our survey were nonetheless vehement in their decision not to buy from the company again. If AT&T is to stay in the personal computer business, the company will have to find a way to lure customers back.

CIRCLE 607 ON READER SERVICE CARD

Austin Computer Systems

by Fredric Burke

COMPANY SCORES



Austin Computer Systems is on a roll. The Austin, Texas-based computer seller has garnered *PC Magazine* Editor's Choices as if the award had been created for it. Since 1987, when the firm entered the mail-order arena, the company's 12.5-MHz 286 earned Austin's first award; this was followed by one for its 386SX earlier this year ("Crowd Pleasers: Entry-Level 12-MHz 286s," January 31, 1989, and "386SX: The New Corporate Standard," January 30, 1990, respectively).

The company's performance on our survey was mixed. For overall reliability, the company scored 82—lower than the 89 average score. And the percentage of people who reported experiencing a problem was alarmingly high—54 percent, compared with 41 percent overall. But satisfaction with technical support got the average 66 score, and repair service satisfaction was also essentially average (72, compared with 75). In the end, most respondents were willing to give Austin a second chance: 78 percent said they would buy again, compared with the overall 80 percent of respondents who would return to the same manufacturer for their next personal computer.

IN FOCUS

Perhaps one reason customers are willing to come back to Austin is the company's new focus on service and support. According to Charles Craft, the mail-order house's marketing director, Austin places great emphasis on the training of its technical support representatives. "We feel everyone on our staff should have strong working technical knowledge. Every technical and service support representative at Austin starts by assembling machines on

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the production line, the better to understand the machines. There's a large library of both software and hardware that allows the technical representatives to create mock-ups of a situation similar to the customer's. We're constantly expanding this library."

Austin's standard warranty is one year parts and labor, which includes third-party on-site service from General Electric. The company also offers extended service

386/20 for AutoCAD applications as well as mailings for local businesses. He has nothing but praise for Austin and his 386/20. "I have found the phone support to be excellent. It's very nice to have people going out of their way to provide an intelligent answer for you. After the new part [a power supply] arrived, Austin even called to make sure that everything was all

despite its brand-name recognition, it's not surprising that a scant 83 Commodore users participated in our survey.

Given the few responses we received from Commodore users, it's not possible to comment on particular models under its helmsmanship. But the numbers do reveal some interesting patterns. Overall, survey participants were happy with their Commodore machines right out of the box. The company's reliability rating was 90, comparable to the 89 average.

Only a small portion of the respondents reported problems with their Commodore PCs—an encouraging sign. Even after an average of two years of use, only 23 percent reported having any problems during the last year, indicating smooth sailing on this part of the course for Commodore, where 41 percent reported problems with the overall PC fleet. The only rough spot for Commodore was that respondents rated the problems as more severe than average (Commodore's severity rating was 49, compared with the average of 45).

Commodore hit rough waters in tech support and repair service ratings, where the company suffered the ignominy of finishing dead last.

"Commodore's technical advice was lousy," said one survey participant.

contracts of up to five years. A toll-free number provides lifetime technical support. To shorten its response times to customer calls, Austin has doubled its support staff since April.

In some cases, Austin will take the machine back and get it running for the customer. Austin replaced an irreparable machine for survey participant James Philippe, a tool designer for KPC Moldmakers of Sanford, Maine. The second machine ran perfectly. Austin also sent survey respondent Edward Luzar of the National Forest Service in Orofino, Indiana, a replacement unit while the company diagnosed his computer's disk drive problem.

Other respondents spoke well of the company's technical support and repair service. Survey participant Pauline DeMotte owns a design studio in Cocoa Beach, Florida. An inexperienced user when she first purchased her machine, DeMotte said she was "apprehensive about the equipment needed for my purposes. Austin's sales staff was extremely helpful not only in making me feel comfortable but in answering questions when some problems arose." The problem was a hard disk failure. According to DeMotte, "Within 14 hours, the new hard disk was expressed from Texas to Florida. Two hours later the General Electric technician was installing it and got it up and running. He really knew what he was doing."

Douglas Figgs, a self-employed engineer from Brooklyn, New York, uses his

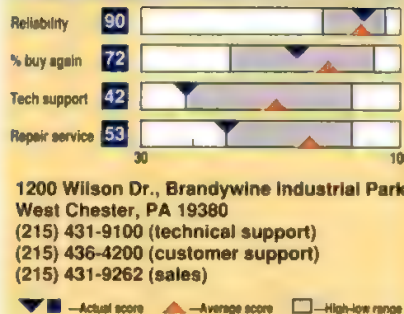
right." Figgs is so pleased that he will consider Austin when shopping for his next PC: "I recommend them to everyone and would not hesitate to buy another. To coin a corny phrase, they're very user-friendly."

CIRCLE 608 ON READER SERVICE CARD

Commodore Business Machines

by John R. Quain

COMPANY SCORES



With 10 million C64 and C128 home computers sold worldwide, Commodore is literally a household name. Among today's business users, however, the Commodore logo is not as common. Commodore was among the first to introduce the personal computer to the public in 1977, but it wasn't until nearly ten years later that the company entered the DOS-compatible world with its PC10 line. So

TROUBLED WATERS

Commodore's sails began to flag, however, when survey respondents were asked if they would buy again from the company. Only 72 percent said they would look to Commodore for their next purchase—lower than the average of 80 percent. Only six PC vendors did worse on customer loyalty. In addition to the often-cited lack of upward mobility, there were two primary reasons respondents offered for their dissatisfaction: service and support.

Commodore hit particularly rough waters in tech support and repair service ratings; the company suffered the ignominy of finishing dead last on both questions. Among the 27 companies in this section, the average rating for tech support was 66; Commodore received an embarrassing score of 42. The average rating for service was 75, yet Commodore got a 53. Why did Commodore seem to be suddenly sailing off course in this part of our survey?

"Commodore's technical advice was lousy," says survey participant John Jennings of his experiences with his PC10-2. A former senior program analyst for ITT, Jennings lives in Hertford, North Carolina, far from a retailer or service center. He attempted to install several different hard disk drives in his PC10-2 but encountered problems each time he tried to

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CIRCLE 471 ON READER SERVICE CARD

DESKTOP PCs

get the drives to work properly.

"It turned out the speaker is mounted on the side of the spare drive bay," he says, and its magnetic coil interfered with the function of the drive. When Jennings contacted the technical staff at company headquarters in Pennsylvania, "Commodore tried to sell me a new ROM BIOS chip that I never needed. It took four letters and several phone calls over five months to get it straightened out." And it took another six months to get a refund for the ROM BIOS chip. Would he buy again?

"Yeah, I probably would," he says, even though he recently had trouble installing a 3.5-inch disk drive, and "Commodore wasn't any help." He still rates his PC10-2 as a reliable machine. Other surveyed users with problems were not as sanguine.

BACK IN THE SHOP

When we contacted Robert Taylor, a Captain in the U.S. Air Force in Honolulu, his PC40-III was "back in the shop again" for 11 days because, even though the mouse driver installation went without a hitch, his computer still refused to recognize the input device. The local authorized service center had just informed him that a motherboard replacement might take another two to three weeks to arrive. Though Taylor says he's pleased with his machine when it's working, because of the service problems he has experienced, he "would never buy another Commodore. I'm just not happy."

Commodore's director of consumer marketing, Thomas Kilcoyne, concedes that the company recognized a while ago "that we didn't have the commitment to customer service." Last spring, however, Commodore launched a pilot program for its Amiga line called Commodore Express. Working with Federal Express, Commodore created a 24-hour tech-support 800 line to answer commonly asked questions. If the hot line operation can't solve the problem, Fed Ex picks up the unit and returns it (or a replacement) to the customer within 72 hours.

At press time the company's warranty is still a no-frills rig with one year on parts and labor for all but the Amiga line. But Commodore just announced that the Amiga's Commodore Express program would be extended to the rest of the C-64 and Select Edition PC lines for products still under warranty. According to Kilcoyne, Commodore plans to follow it up with an out-of-warranty service program,

and the company is trying to "fine-tune [its] dealer base and work with the dealers."

The bright spot on our survey was the low incidence of problems reported with Commodore machines. But to win back flagging customer loyalty, Commodore will have to work hard to improve its last-place finishings on tech support and re-

nies got lower scores for satisfaction with repair service.

The results for the Deskpro 386/20—which won our award for technical excellence in 1987 ("Awards for Technical Excellence: And the Winners Are ...," January 12, 1988)—are even more dramatic. Respondents rated the machine above-average on reliability, giving it a score of 95 (compared with the average score of 89 for all 386-based systems).

The good news for Compaq is that respondents rated its products as average on reliability, and an average percentage said they'd buy from Compaq again. The bad news is that only one PC manufacturer fared worse on tech support.

pair service. Its recent efforts to seal these leaks suggests that passengers on the good ship Commodore may encounter calmer waters in the future.

CIRCLE 609 ON READER SERVICE CARD

Compaq Computer Corp.

by Mary Kathleen Flynn



Compaq, whose share of the PC market is second only to IBM's, received mixed scores on our service and reliability survey. The good news for Compaq is that respondents rated the company's products as average on overall reliability, and an average percentage of participants said they'd buy from Compaq again. The bad news is that out of the 27 PC manufacturers we reviewed, only one did worse than Compaq when it came to satisfaction with technical support. And only three compa-

And 89 percent of the participants who use the Deskpro 386/20 indicated they would go back to Compaq for another machine—higher than the 84 percent of all 386 respondents who said they'd buy again from the same vendor. But satisfaction with repair service was below average (67, compared with the average 74 for 386s). And with a score of 50 for satisfaction with technical support, the Deskpro 386/20 came in behind every other 386-based PC on our survey.

It may seem unfair to associate these low service and support scores with Compaq itself. After all—officially, anyway—the company doesn't provide any support or service directly to the end user. But, as spokespeople from Compaq are quick to point out, the quality of service and support is increasingly a factor when it comes to buying decisions.

When confronted with Compaq's poor showing for tech support and service on our survey, company spokesperson Mike Berman says, "The information that we see is that the dealer channel is the way to go." Berman points to the annual Fortune 1,000 poll conducted by Gallup and Robinson, a Princeton, New Jersey-based market research firm. Participants in the Gallup and Robinson poll cite service as the reason they buy most of their PCs from dealers. "Yes, some people want to work directly with manufacturers," Berman continues, "but we believe that business users want to go through dealers. In today's multivendor world, the local dealer can offer the customer an overall solution

DESKTOP PCs

that includes Compaq but also includes other equipment, like monitors and fax machines, that the dealer knows how to support."

Compaq trains and certifies authorized dealers, who in turn offer technical support and repair services to users. Unlike IBM, Compaq doesn't require its authorized dealers to provide a minimum level of service and support, and it doesn't augment the dealer's programs with offerings of its own. "We let the dealers decide how to run their own businesses," says Berman. "Compaq has always used only the one channel, the dealer channel. And we want to do what's best for our dealers."

Dealers agree that Compaq is there for them. Bill Waas, vice president of service for ComputerLand Corp., says, "Compaq has always been very cooperative to the dealer channel. They've always listened to our needs." ComputerLand has given Compaq its Service Vendor of the Year Award twice in the last three years, and Waas predicts that Compaq will be this year's winner, too.

Although Compaq bends over backward to support its dealers, it leaves end-user support to dealers' choice.

LIKE THE CABOTS AND THE LODGES

But not all dealers are created equal and sometimes even authorized dealers fall down on the job. Survey participant Valerie Vann is an engineering technician and systems support specialist at Sacramento, California-based Murray, Burns, and Kienlen. She bought the office's Deskpro 386/20 two and a half years ago: "We're a small engineering office, and this was going to be our first high-powered system," she recalls. "It was a large expenditure for us, but we needed it to run some fairly hefty FORTRAN programs, and we wanted to add peripherals. We bought it through an authorized dealer, realizing we would need support. But the dealer knew less than I did. If I hadn't bought Compaq's manual—which was good, but it cost me a hefty \$120—I wouldn't have been able to configure the system."

Later, the dealer's tech support staff was unable to help when she had problems with the tape drive and the CD-ROM drive. And when the system failed under warranty, three weeks passed before it was returned to her office; and it was missing slot covers and had a damaged cable connector. On top of all that, her

dealer moved to L.A. "If your company is a member of the Fortune 500," Vann complains, "Compaq will send someone out. But if you have only two or three of their machines, you're pretty well on your own. Compaq simply will not speak with small companies—only God and the Fortune 500."

Other survey participants expressed resentment at Compaq's hands-off approach even when they found their deal-

ers cooperative. As director of computer services at Sasaki Associates in Watertown, Massachusetts, Tricia Smith buys 20 to 30 Compaq PCs each year. "Compaq's technical support is the worst I know," she says, "basically because of access problems."

Recently, Smith was experimenting with Compaq's graphics boards and tape drives, using undocumented settings on the tapes. "When I tried to call Compaq to determine legitimate combinations," she reports, "I couldn't reach anyone because there is no technical support service available to end users. So I went to my dealer, and because I have such a large account, he let me use his Compaq ID number. I had to pretend I was a dealer to get any information."

STICKY KEYBOARDS

Smith says she would buy again from Compaq, but she'd "stay away from the Deskpro 386S." Having bought several of the 386SX-based Deskpros, Smith is not a fan. "We had quality problems with the keyboards," she explains. "They really weren't very good at all." Indeed, 13 percent of the survey participants who use a Deskpro 386S and who reported a problem in the previous year attributed the problem to their keyboards—higher than the 5 percent average for 386SX-based systems.

Although Compaq's Berman says that the company's own research does not show problems with keyboards, our survey results also indicated trouble with the keyboards on the Deskpro 286: participants blamed keyboards for 8 percent of their Deskpro 286 problems, compared with 3 percent for 286-based PCs overall. Respondent Art Linville, president of Bluegrass Paving and Excavating in Lexington, Kentucky, was one of those who had keyboard troubles. Two and a half years ago, he bought a Deskpro 286 to handle the job-cost accounting for his construction contracting company. Earlier this year, his keyboard stopped working. A first-time computer owner, Linville was surprised that Compaq and his dealer, the Lexington-based chain, Valcom Computer Center, wouldn't replace it for free. "I wasn't about to spend the 260-odd bucks for a Compaq keyboard. So I bought a KeyTronic 101 for about 90 bucks from a mail-order house, PC Connection."

Money matters may make Linville look elsewhere for his next computer. "I have

Compaq Computer Corp.

80386 models



Compaq Deskpro 386/20e



Compaq Deskpro 386S



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8086/8088 models



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Legend: Actual score (solid bar), Average score (triangle), High-low range (outline)

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Reason #3

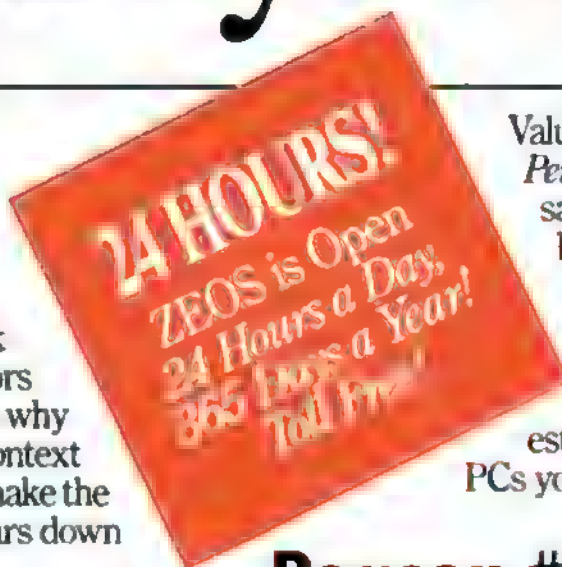
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Complete entire application.
- ☐ **INDIVIDUAL CREDIT** but rely on income or assets of another person as a basis for repaying the credit requested. Complete entire application.
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Since? (Mo./Yr.) _____ ☐ Buy ☐ Rent ☐ Other _____

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VISA			_____	_____	_____	_____	_____	_____	_____
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DESKTOP PCs

a lot of respect for Compaq," he says, "but as a small business owner, I have to worry about every dollar. I'm not going to pay \$500 more just to get an authorized dealer. And, as much as I like Valcom, if I can find a better price at an unauthorized dealer, I'll take it. And I'm fully aware of options besides Compaq—I'd look at AST and mail-order outfits like Dell."

POWER DOWN

In addition to keyboards, one other problem area showed up on our survey: power supplies. The difficulty occurred most frequently with Compaq's 8086/8088-based systems: 31 percent of the reported problems with those machines were related to the power supply, compared with the 10 percent average for all 8086/8088-based machines. Compaq says its older machines did have problems with power supplies but they've been fixed, and the company no longer sells 8086/8088-based machines.

Compaq's 286s had their share of power supply complaints, too: 10 percent of the reported problems were caused by power supplies, compared with 6 percent for all 286-based PCs.

Respondent John Legg was one of the Deskpro 286 owners whose power supply failed him. A pilot for TWA who uses his home computer to get the airline's flight schedules, Legg bought his Deskpro 286 almost five years ago. "My computer just started rebooting itself," he recalls. At that time, his dealer—the ComputerLand store in Stamford, Connecticut—was still doing in-store repairs. "I took it in, and they repaired it on the spot."

But the local store no longer does repairs. When his disk drive quit reading floppies earlier this year, Legg had two choices: drive to the New Haven ComputerLand, which does repairs, then wait three days for the work to be done, or buy a new drive. He opted for a new drive.

Although Legg still believes his Compaq was the right machine for him at the time, he looked elsewhere when it came time to buy a 386. He chose a Northgate 386/20, in part because when he'd wanted to add an Enhanced 101-key keyboard to his Deskpro 286, Compaq wouldn't work out the incompatibilities; Northgate would. He was also impressed by Northgate's replacement parts policy. And so far, Northgate hasn't let him down. "When a plastic part on my floppy disk drive broke, they sent me a drive, which arrived the next day," he said.

Compaq is still the undisputed Number 2, but the company may have to reconsider its strict call-your-dealer approach if it wants to hang onto its market share.

CIRCLE 610 ON READER SERVICE CARD

CompuAdd Corp.

by Ann Sherman

COMPANY SCORES



The CompuAdd legend is well documented. CEO Bill Hayden began his empire in 1982, peddling computer add-on equipment. In a little more than eight years, his one-man outfit has burgeoned into a \$400 million mail-order and retail enterprise. Today the company offers its own line of PCs as well as a bevy of software and peripherals. Its growing customer base and their high satisfaction are reflected in our survey.

CompuAdd respondents numbered third-largest on our survey; 910 answered—close on the heels of Compaq's 1,079 responses. The percentage of CompuAdd respondents who reported problems—49 percent—was higher than the 41 percent average for all PCs. However, those respondents still gave the CompuAdd PC a reliability rating that matched the average of all PC responses. More important, 88 percent of CompuAdd respondents would buy again from the company—notably higher than the 80 percent for PCs overall.

How has the company generated such loyalty? The answer is support and quality. Survey participants indicated that when they encountered problems, CompuAdd was very helpful. Indeed, the satisfaction rating for technical support was 73—higher than the 66 average for all PCs. And once the machines were fixed, few had recurring problems.

Bruce Patton, deputy director of the

Harvard Negotiation Project in Cambridge, Massachusetts, bought 20 CompuAdds for his office. He's had his own 286/12 for about two years. Despite initial problems with the system, Patton, like many other respondents, is positive about his experience and would buy CompuAdd computers again.

EASY TO REACH

Encountering intermittent RAM parity problems soon after buying the machine, he found the technical staff very helpful: "The hot line is quite good. The people I talked to were easy to reach and very knowledgeable. Although they were familiar with the problem and suggested several solutions, the chip ultimately had to be replaced. CompuAdd was very cooperative about fixing it; they replaced the motherboard, and it's been over a year since I've had any problems."

Patton's general feeling is that "once the machines work, they prove to be reliable and very compatible." He believes that CompuAdd offers the best bargain among clones and concludes, "Although CompuAdd machines are \$100 to \$200 more than the cheapest of the large mail-order houses, the fine service and basic system design are well worth the extra dollars and minor problems."

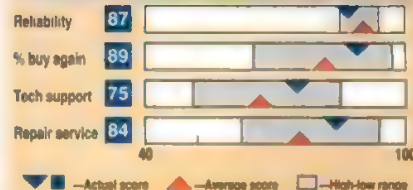
Patton's experience was similar to that of home user Richard K. Johnson, vice

CompuAdd Corp.

80386 models



CompuAdd 286/12



president of marketing for Congressional Information Service in Bethesda, Maryland. When Johnson first received his 286/10, the clock batteries were defective. He found CompuAdd's technical support hot line "very helpful. They figured out the problem and sent replacement batteries quickly." While he had to

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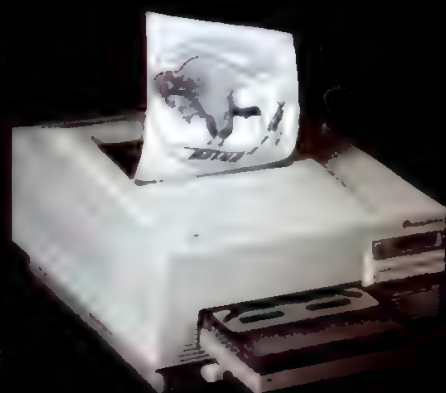


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DESKTOP PCs

replace the power supply a year later, he feels that none of the problems he's had are serious. Of his experience he says, "CompuAdd is pleasant to deal with, has good support, and offers a good value in a computer." He, too, would look to the company for new equipment.

Typical of 386 respondent experiences was that of Clark R. Williams, a product design director for Dallas Semiconductor in Dallas, Texas. Williams filled his department with CompuAdd 386 systems. He reports, "I couldn't give the computer a reliability rating higher than 60: I encountered motherboard, CMOS, and RAM parity problems. However, the problems occurred within the first year, and CompuAdd replaced the machine [leaving the original hard disk]." He resolved the CMOS problem himself by replacing the clock with one that his company makes.

Like 286 respondents Patton and Johnson, Williams would buy again from CompuAdd. He says, "I bought the machines originally because they could support OS/2 and Unix, so they suited an engineering environment; they also had the best price/performance ratio among clones. I would buy again for the same reason: CompuAdd gives you the best bang for your buck."

As already noted, the percentage of CompuAdd respondents reporting problems with their machines was higher than average. And although the survey results show no significant problem areas, a few categories revealed an incidence of problems slightly above average.

DEFECTIVE MEMORY

One problem area for 286 respondents was memory capability. Of the often-sited RAM parity errors, company spokesman John Pope says, "We have determined this to be a problem and will correct defective chips in the machines we have already sold." In addition, CompuAdd "now designs [its] own components, which have eliminated the problem in new machines altogether."

Another 286 problem that several respondents mentioned was power supply failure. In this area, CompuAdd found that "one particular vendor delivered defective products that caused certain systems to lock up. When the failure rate became unacceptable, [CompuAdd] informed the vendor, who has since corrected the problem."

CompuAdd 386 respondents reported an occurrence of motherboard problems

that was also slightly above average. According to Pope, CompuAdd is not aware of any problem with defective motherboards. He reports, "When the motherboard has a defective chip, we will often replace the whole board if the chip is soldered down. If the user does not have a high level of experience with swapping components, then it's easier to send them the entire board."

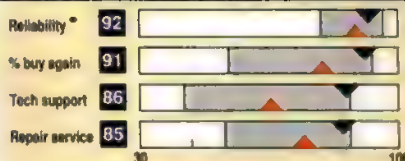
CompuAdd has generated good results in our survey. Users are satisfied and willing to stay with the CompuAdd label. Of the company's future, Pope is very optimistic. He says, "CompuAdd is spending more money to make itself better in all areas. We are instituting quality programs to monitor vendors, spending more time on in-house technical training, and expanding our retail support base."

CIRCLE 611 ON READER SERVICE CARD

Dell Computer Corp.

by Kellyn S. Betts

COMPANY SCORES



9505 Arboretum Blvd.
Austin, TX 78759-7299
(512) 338-4400
(800) 426-5150 (sales)

Actual score Average score High-low range

If the survey ratings for overall reliability, satisfaction with technical support, and satisfaction with repair service were final school grades, Dell, Northgate, and Swan would all be awarded top honors. But if you were to add to its service scores the accolades the six-year-old company's products have received in these pages—including eight *PC Magazine* Editor's Choices—Dell would arguably be the company serving in the valedictory role.

MIGHTY MAIL-ORDER TRIO

Out of the 27 PC manufacturers included in our survey, three mail-order houses—Dell, Northgate, and Swan—did the best. And while a quick look at the scores may suggest a winner among the top three, a

Dell Computer Corp.

80386 models



80286 models



Actual score Average score High-low range

careful look at the numbers shows the three to be about equal: Dell's and Swan's 92s for overall reliability are roughly equivalent to the 89 average and to Northgate's 88. On technical support, Dell got an 86, Swan got an 87, and Northgate got an 84—all about equal and far better than the 66 average score.

For satisfaction with repair service, the three mail-order houses also performed similarly on our survey: Dell got an 85, Swan got an 87, and Northgate got an 86. Again, these scores were all well above the average 75 score. The three companies scored about equally on repeat customers, too: 91 percent said they'd buy from Dell again; 90 percent said they'd return to Northgate; and 93 percent stated they'd buy again from Swan.

Finally, it's important to consider the number of responses each company received. Dell and Northgate both garnered a large pool of responses: Dell got 787 (the fifth-largest group) and Northgate received 826 (the fourth-largest group). But Swan got only 94 responses, which means the scores represent a narrower base of user experiences.

SERVICE THAT BOGGLES THE MIND

Not unexpectedly, many of the users who rated Dell's service and support so highly lavished it with praise in follow-up interviews. "I have not had any customer [using a different brand] get the mind-boggling service and attitude that Dell provides," attested John J. Ulrick, the owner of Minnesota-based Ulrick and Associates, a group of consultants and programmers. Ulrick, who uses a Dell 386/16, said his customers have purchased many different brands of computers, "but even though some competitors offer simi-

DESKTOP PCs

lar services now, they are often inconsistent, rude, rushed, or not knowledgeable when contacted." He said he tried local manufacturers like Northgate and Zeos with hope that they could outdo Dell, but they have yet to succeed in his eyes. "I'm hoping other manufacturers will eventu-

Editor's Choice last year ("80386: The Power and the Glory," May 30, 1989). After buying the 20-MHz machine, our respondents reported an above-average incidence of problems with motherboards

Respondents were extremely pleased with the service they received: "Dell called back three times to see if I was happy."

ally handle people and problems as well. Dell needs the competition."

Roberta Ries is the chief of the Office Management Branch of the Bureau of Reclamation in Littleton, Colorado, and is responsible for the department's 95 Dell PCs, a mixture of System 200s, 310s, and 316s. "We have found the products exceptionally reliable," she said. "Additionally, its technical support and on-site service are unsurpassed in terms of efficiency and responsiveness." Some of the System 316s had bad power supplies, she explained, and the Xerox representatives (Dell's third-party service provider) were there "within several hours."

BIOS TROUBLES

Not all of Dell's PCs have been as reliable as those at the Bureau of Reclamation, however. Despite the healthy overall reliability score of 93, 53 percent of the respondents using Dell's 286-based machines reported experiencing a problem in the last year—compared with the 42 percent who reported a problem with any 286-based system. Most of these glitches were minor; survey participants judged the severity rating of Dell's 286-based complaints at a mere 23, compared with the average severity rating of 43 for 286s. Interestingly, 8 percent of the respondents using 286-based units reported having the BIOS problems that once plagued all these units, compared with the 2 percent of respondents who complained of this problem with any 286-based PC.

Dell's 386-based PCs received a high score of 92 for overall reliability, but again respondents reported a higher-than-average percentage of problems with the machines; 48 percent reported a problem, compared with 42 percent overall for 386-based machines. And, 46 percent of respondents reported a problem with the Dell System 310, which was awarded an

and disk drives, and an average number of other problems. But 92 percent of the same 310 users said they would buy again from Dell, which implies that the company's technical support and repair service handled the problems well.

SOLID SERVICE

Dell manages to keep its customers happy without paying for mailing costs or automatically overnighting replacement parts (it will ship next-day air at the customer's request), though a free year's worth of on-site service from Xerox comes with every computer.

Dell's service and support teams complement each other. Gene Marz's experience with a Dell 310 his company—Iowa-based Design Engineers, P.C.—purchased is typical. "Our first machine had a hard disk failure on its second day," said Marz, the engineering technician responsible for selecting and supporting the company's PCs. "Dell's technical support staff talked me through a reformat and system checks for about 45 minutes. When nothing worked, a new hard disk was installed the next day by Dell's on-site service provider [then Honeywell-Bull]." Marz was satisfied enough with the service to purchase a second 310 later.

HAPPY ENDINGS

Survey participant Gregory Penk's experience wasn't as overwhelmingly positive, but it did have an equally happy ending. When the motherboard and the disk controller on the supervising electronics engineer's Dell 310 failed, the Xerox representative Dell sent out to the Department of Defense's NESEA division didn't succeed in fixing it. So Dell overnighted the parts to Penk so he could do the repair himself, providing him with a mailer to use to return the broken product to Dell at its expense. "Dell called

back three times to see if I was happy after I repaired the system," he recalled.

In all, nearly three-quarters of our Dell-using survey respondents told us they'd used the hot line to the company's 90-person technical support staff, and two-thirds of those respondents reported being "very satisfied" with it. For example, when Grant Holland, vice president of finance for Arizona-based First National Utilities Inc. experienced problems with his Dell 310, he said he found the company's 6 A.M. to 6 P.M. (E.S.T.) technical support line to be "exemplary." But he also said he sometimes had problems getting through, sentiments echoed by many other survey respondents.

Despite minor complaints, survey respondents were extremely pleased with the service they received from the mail-order house. Dell may initially entice its mostly mail-order customers with its high performance/price ratio, but that's certainly not what keeps them satisfied. As Bill Adams, marketing director for New Mexico-based Computer Guys, put it: "The system 310 has been a dream despite some seemingly serious motherboard problems. The difference I feel between Dell and Datavue [a company whose products Adams also had problems with] can be measured in response time. I can handle a hard disk drive failure, but not 30 days to have it fixed."

CIRCLE 612 ON READER SERVICE CARD

DTK Computer Inc.

by Nathaniel Zelnick

COMPANY SCORES



15711 E. Valley Blvd.
City of Industry, CA 91744
(818) 333-7533

Legend: ■ Actual score ▲ Average score □ High-low range

DTK Computer Inc. is the U.S. subdivision of Datatech Enterprises of Taiwan, one of the largest makers of motherboards for the OEM market. Its components appear in a number of personal computers, including CompuAdd's, and in a variety of configurations. DTK's line—which



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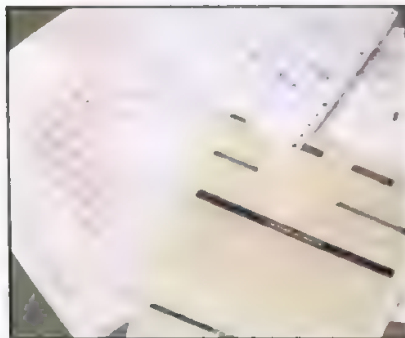
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TEXAS
INSTRUMENTS



CIRCLE 353 ON READER SERVICE CARD

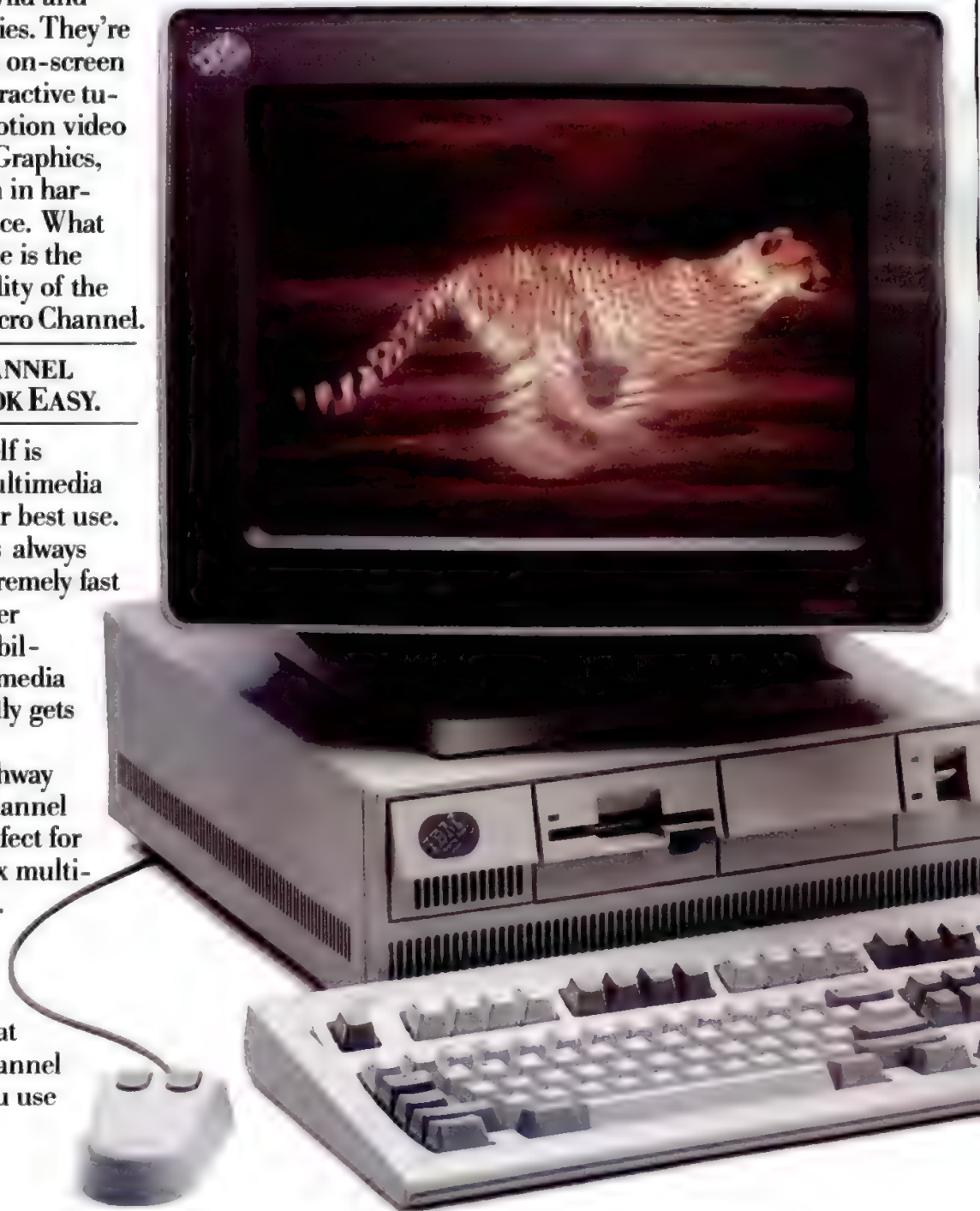
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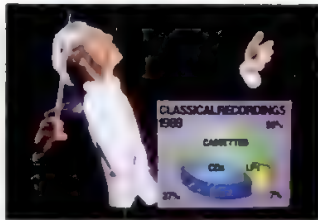


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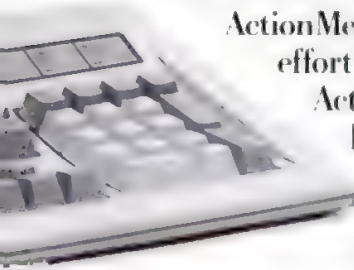
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DESKTOP PCs

includes systems from XT compatibles to 386s, as well as a 486 file server and a laptop that were released after our survey was distributed—seemed versatile, inexpensive, and efficient to our survey respondents. DTK received average scores for both overall reliability and satisfaction with technical support and repair

DTK's Bayens explains that with relatively inexpensive items, replacement parts could be shipped before receipt of the damaged parts, but for major repairs, DTK's technical support staff would need to examine the items first. DTK ships one

the company's statement that a quality product is the best defense against difficulties.

Only 31 percent of our respondents reported any problems with their Epson computers (compared with 41 percent overall). And when something did go wrong, they indicated, the problem usually wasn't serious; Epson problems received a severity rating of 38, lower than the 45 average. While nobody claims these PCs are outstanding, their reliability has earned them a solid following: 81 percent said they would indeed buy their next computer from Epson, indiscernible from the overall 80 percent who would buy from the same vendor.

"My Epson performs to my expectations. It's the best I can get for the money, and I can't think of anything that wasn't up to par."

service. The survey indicated a favorably low incidence of problems: 31 percent of respondents compared with 41 percent for all PCs. Those who ran into trouble reported a small scattering of typical problems; DTK's rating for problem severity was 37, compared with the average 45.

DTK deals mostly through distributors, which it designates as dealers, and asks that customers direct their service questions to them first. Dealers carry replacement parts, but generally will send dysfunctional machines back to DTK's U.S. headquarters in City of Industry, California. DTK has regional offices in Texas, Florida, New Jersey, and Illinois, and has two offices in Europe, each of which offers 8:30-to-8:30 tech support to end users. Though it doesn't have an 800 number, DTK does offer a 24-hour bulletin board service, which also provides service information.

According to Tom Bayens, DTK's director of marketing, the company had considered initiating a program of on-site repairs through an authorized third-party service center, but finally decided against it. "While it was excellent from a marketing standpoint," Bayens notes, "it was too expensive, considering the small volume of problems that we have. We'd much rather keep our prices competitive."

BIOS: NOT BAD

Paul Sittler, a computer systems engineer at Texas A&M University, reports that the first version of DTK's ROM-BIOS was incompatible with OS/2-extended V1.1. DTK replaced it free of charge two days after a call to the Houston office. "Actually, DTK BIOSes are not bad," Sittler said, noting that the problem had since been cleared up. "I modify a lot of different BIOSes and was impressed with theirs."

way for all items, in the same manner it receives them, which includes overnight delivery.

Some of our respondents registered anxiety about the volatile PC-compatible market. They worry about the number of fly-by-night companies and the possible disappearance of the company that gave them their wonderfully cheap clone. While DTK's brand-name computer line continues to capture a relatively small percentage of the market and is therefore unfamiliar to most users, the company is not about to fade away. Because of its modest size, DTK's simple service and technical support network is sufficient to answer the needs of any troubled DTK owner.

CIRCLE 613 ON READER SERVICE CARD

Epson America Inc.

by Robin Bornstein

COMPANY SCORES



23530 Hawthorne Blvd.
Torrance, CA 90505
(213) 373-9511
(213) 539-9140 (sales and technical support)
(800) 922-8911 (dealer information)

▼ Actual score ▲ Average score □ High-low range

During the 15 years Epson has been in the PC business, it has been known for dot matrix printers, which have gained an enviable reputation in the printer industry. Epson deserves yet another laurel for its PCs: results from our survey place Epson computers smack in the center for average reliability, thereby backing up

UP TO PAR

"It's the best I can get for the money I invested, and I can't think of anything that wasn't up to par," explains J. L. Black, a senior electronic designer at the Detroit Tool and Engineer Company in Lebanon, Missouri. "My Epson performs to my expectations without any unusual incidents, either positive or negative. I've hooked up other stuff to it, and I've never experienced any incompatibility problems."

Respondents are also pleased with Epson's expansion capabilities. Steve Zimmerman, who works at the California Law Revision Commission in Palo Alto, says his computer "still has slots left, even after all the junk I've put into it. The way the slots are set up, it's easy to work on this system without pulling all the boards out. It's a good workhorse computer." Epson's PCs are not complex in design, and the company keeps the hardware setup fairly constant across its product line.

There are other benefits to Epson's architecture. "We try to make the product friendly so users can add items to the bus, configure their system with different applications, and still have trouble-free operation," explains Dick Bulot, Epson's vice president of customer service. "When you have something that consistently works well, if something does go wrong, the reseller can easily obtain parts from Epson."

Although satisfaction with Epson's repair service was about average (77 compared with the 75 average), tech support was rated lower than average by survey participants who required support (60 versus 66). "I tried to add a 3.5-inch floppy drive to my Equity III Plus, and I called for support," complained Zimmer-

DESKTOP PCs

man. "When I called the 800 [sales] number, I was connected to a voice-mail system. I hung up on it and called the toll number. The person told me I would have to order the necessary parts from my dealer. It was a typical ring around the rosie."

BEHIND THE SCENES

Epson's Bulot maintains that the company makes a point of directing these types of calls to the reseller, but end users shouldn't feel that they're left in the dark. "When we sell something to individuals, we feel they are our customers. To sell and service Epson products," Bulot continues, "our resellers have to meet a certain level of professionalism and are fully trained. It makes sense that the user should bring a problem to the place of purchase, although he or she should remember that Epson is always behind the scenes for support." The company also continually monitors reseller performance through a database that stores all problems encountered by the resellers.

Epson's resellers carry most of the responsibility for servicing and repair, and the company invests a lot of effort in supporting them. Bulot explains that "not only do we ask resellers what they need to serve the end user, we also conduct blind surveys which target the reseller and end-user community." These gauge servicing and product performance.

Our survey not only showed the level of satisfaction with Epson's computers on the whole, it also revealed that respondents are happy with Epson's older 8086/8088 models; they scored 94 on overall reliability, compared with 91 for all 8086/8088s. Epson is one company that makes good on its promise to stand behind its

products—it still supports computers that are seven years old, although the company doesn't usually need to do anything more involved than provide spare parts and technical documentation. Discontinued models are also supported.

Epson's computers are a real-world example of "slow and steady wins the race." Turn to Epson for unremarkable but solid, reliable workhorses.

CIRCLE 614 ON READER SERVICE CARD

Everex Systems Inc.

by Gretchen Luchsinger

COMPANY SCORES



23530 Hawthorne Blvd.
Torrance, CA 90505
(213) 373-9511
(213) 539-9140 (sales and technical support)
(800) 922-8911 (dealer information)

▲ —Actual score ▲ —Average score □ —High-low range

Everex Systems is well known for the speedy performance and low prices of its machines. A very favorable ratio seemed to be the major drawing card for survey respondents who own PCs from Everex's Step line of CPUs, first introduced three years ago.

And while end users rated Everex average on reliability (92) and satisfaction with support (69) and service (76), a high 91 percent of respondents say they would buy another Everex PC—compared with 80 percent overall.

PLANS TO PURCHASE

Wayne Schneider, who works in research and development, designing automated library software for Dynix Marquis Inc., has bought several Everex machines and plans to purchase more eventually. He bought his first lot of 16 two years ago. Schneider was so impressed that today he runs more than 20 Everex 386/25s, 286/12s and 16s, and 386s in his lab in Provo, Utah, where he says performance is critical. "We haven't found anyone who can outperform them for the price," he remarks.

To date, Schneider has encountered

few problems with the machines. With his first purchase, he experienced one or two memory defects. Everex willingly swapped motherboards. The only problem, Schneider found, was getting through. "Their support lines were always busy. Once they got on, though, they were responsive. I've waited half an hour and longer," he says.

Everex purports to have changed that state of affairs. Ron Earley, Everex's manager of technical support and services, explains that the company simply outgrew its telephone system and finally made a switchover to its current setup last April. "The new system is more efficient in distributing calls," Earley says. "We do spot checks every other day on hold time. Now the average is a minute. Before it was three to five minutes."

Earley has also hired additional tech support people: the number is currently at 50 for the 2,500 calls the company receives per day, and he expects to add another seven people in the coming months. Of course, one problem with Everex's support line is that the calls themselves aren't free. Everex, while offering free tech support for the life of a machine, doesn't have an 800 number.

The reason? Everex farms out its products—including its line of peripherals—through national and regional distributors, as well as through independent dealers and value-added resellers. The company encourages end users to turn to these service providers first, although as Earley is quick to point out, "We troubleshoot as we can when a customer contacts us directly. We don't immediately make end users go back to the dealer. We ask if they have contacted the resellers because they often have the parts. If they don't, we send the part out and, [if the unit is] under the first-year warranty, on-site service installs it."

Survey participants interviewed for this article revealed that it may sometimes be wiser to turn first to the source of purchase rather than to Everex. Charlie Welcome, the treasurer of the Caspian Area Center Inc. in Greensboro, Vermont, bought his single Everex 386/20 from the Quill Corp. When a DRAM chip and a video card started acting up, Welcome called first Everex and then Quill. To sum it up succinctly, "the dealer was great, and Everex stunk." Welcome continues, "The people at Everex just kept defending their product—they couldn't help me out. They were rude, and they refused to perform

Epson America Inc.

80286 models

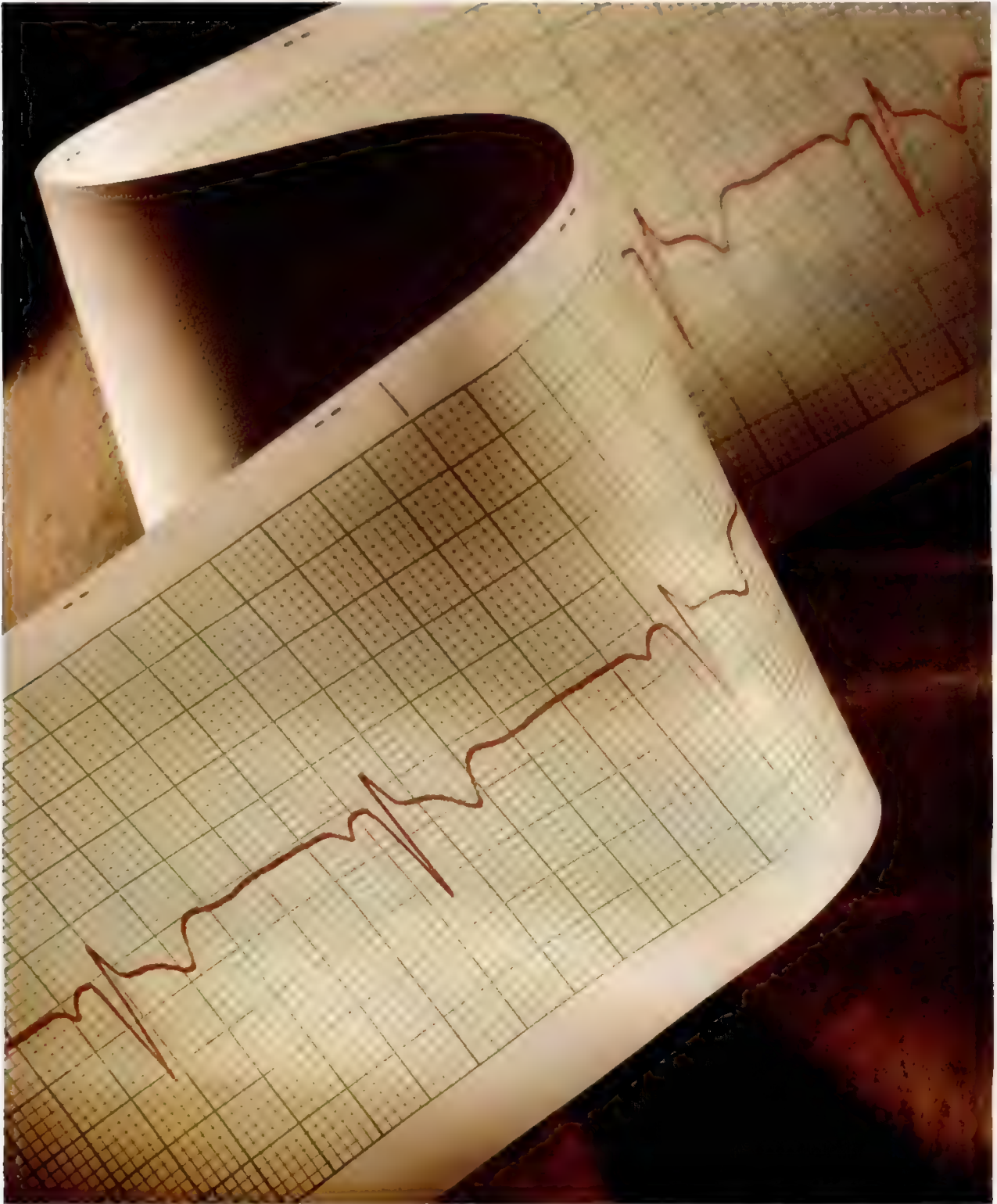


8086/8088 models



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The Past, Present, and Future
of Network Computing.

Gateway 2000

by Fredric Burke

any kind of diagnostic." Since the machine had come with a one-year on-site service agreement from Everex, Welcome had assumed he would be supported by the company. When his efforts proved fruitless, he turned to the dealer. Quill replaced the DRAM chip and exchanged the video board.

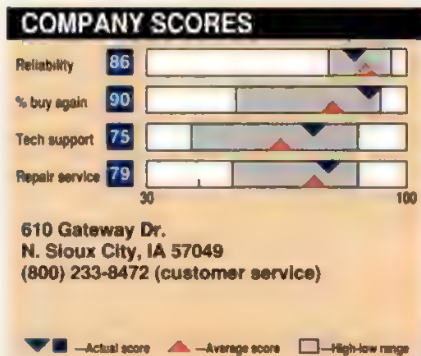
Unlike the 91 percent of our respondents who said they would buy from Everex again, Welcome, who uses the machine mostly for word processing at the nonprofit center for children, would only buy another Everex machine "if that's all Quill had."

IN-HOUSE DESIGNS

The survey results did not pinpoint specific sources of malfunctions in Everex machines, and the 45 severity rating of problems was only average. Everex tech-support manager Earley attributes this to the company's policy of designing most Everex equipment in-house—although it is later manufactured to those specs at other plants. "We definitely do all the engineering," says Earley. "The BIOS and hardware people are all in-house, which means there is a faster resolution when things go wrong."

This in-house expertise is a plus for end users, who can expect that if they do call Everex, they will be able to find *someone* who knows their stuff. And for really esoteric complaints, the company has installed an escalation program that directs tough problems to senior members of the staff.

The Everex line of systems provides a solid option, for both their high perfor-



"Service," says Ray Kayl, Gateway 2000's technical support chief, "is the most important part of the industry. We're not perfect yet, but we're getting there." Gateway has come a long way since its humble beginnings a few years ago. Now the mail-order company sells its effective, inexpensive machines to nearly every sector of the market and is growing by leaps and bounds.

Respectable showings on PC Labs' tests have further bolstered Gateway's reputation for low-cost performance, and the company is increasing its efforts on the service and support fronts. The evidence is in the positive survey results. For overall reliability, the company scored 86—approximately the same as the 89 average for all PCs. And Gateway shared top billing with such heavyweights as Compaq, IBM, and HP for those who

"Service is the most important part of the industry," says Ray Kayl, Gateway 2000's technical support chief. Evidence that Gateway takes service seriously is in the high marks it received on our survey.

mance and their low price. With healthy scores in overall reliability and satisfaction with tech support and repair service, the Step PCs look even better. As always when you are considering manufacturers that let dealers handle service and support, the decision to choose an Everex system should begin with exploring your local retailer or VAR.

CIRCLE 615 ON READER SERVICE CARD

would buy their products again: 90 percent of the Gateway respondents said they'd buy again from the company, significantly higher than the 80 percent overall result. For tech support, Gateway scored 75—higher than the average 66. For repair service, Gateway got a 79, compared with the 75 average score.

For a company that has enjoyed such a meteoric rise in its fortunes over the last

few years, Gateway has managed to keep both a tight lid on reliability problems and an eye on supporting the customer. Gateway's standard service contract is typical of the industry. The company provides a 30-day money-back guarantee and a toll-free number that gives free lifetime technical support. Labor costs are free for life, too, provided the machine is sent back to Gateway. The company also offers on-site support from TRW, which charges for labor. Gateway's bulletin board, Galacticom, conveys service bulletins and other communication.

SNARLING PHONES

If Gateway has felt the pangs of its rapid growth anywhere, it has been in its phone support. Despite Kayl's best efforts, there have been remarkable snarls in getting customers in contact with people at the manufacturing end. According to Kayl, time on hold should not exceed 5 minutes. "Mondays are the worst," he says. "There are generally 15-minute delays." Survey

Gateway 2000

80386 models

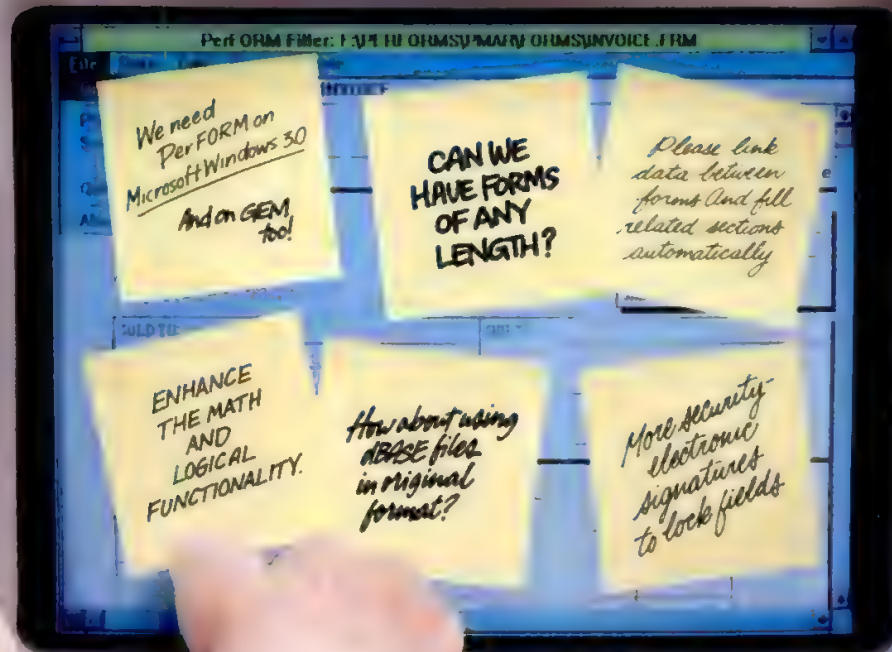


participants interviewed for this story, however, talked about delays of anywhere from 20 minutes to two days.

Bill Gildea, the president of H.E.T.I. in Rock Island, Illinois, experienced a 20-minute wait to get a tape drive problem for his SX resolved. But the next day he had the cable he needed. Gildea and his company are considering the purchase of more machines from Gateway and he has recommended the 386SX-based machine to others, several of whom have purchased them.

One respondent, Chris DeFalco, a CAD operator for the New York City firm Electronics Systems Associates, had a 386/33 with a defective motherboard and a faulty 3.5-inch floppy disk drive, while the hard disk was adding bad sectors daily, a problem eventually traced to the controller card. Two days went by before a tech support operator returned his call—the system had been inoperable the whole time. Once DeFalco got through, though,

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CIRCLE 268 ON READER SERVICE CARD

DESKTOP PCs

he found Gateway "really cooperative. TRW's service was excellent, and Gateway extended the money-back guarantee for another 30 days. I've since ordered six more 33-MHz towers."

Another customer who is considering ordering more machines from Gateway is Edward Groves, the manager of technical support for GSC, a software development company based in Lansing, Michigan. He needed a new I/O card for his 386. It arrived in 36 hours. "When I have ordered through the mail from this company, there have been no problems, no hassles; everything works. I've gotten used to a company that has made a commitment to good service."

While few complaints about the hardware itself were registered, Kayl and his staff are looking at ways to improve their already high standard. "There are currently more people in training than ever before. They are started on the production line and promoted according to ability. Most representatives currently have six months to a year of production experience." The bottom line for Kayl and his staff? "Once one of our representatives has someone on the phone, they're not off until the customer's problem is resolved. We'll make sure that the customer is talking to the right person."

SPECIALIZED SUPPORT

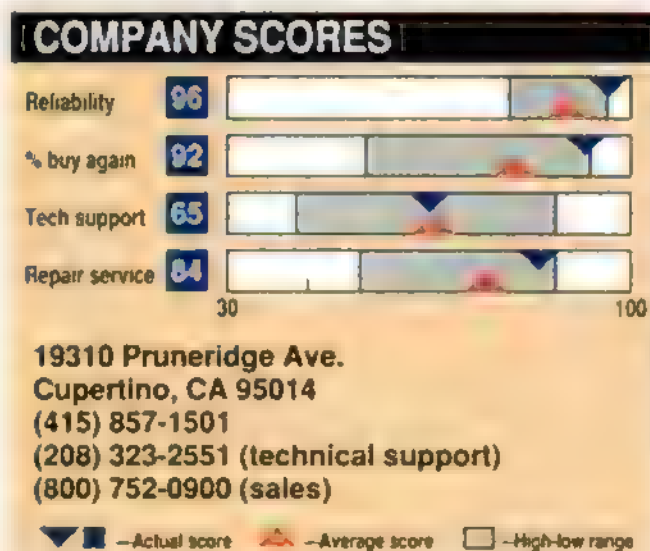
Kayl is looking to divide his department up into specialists in software and hardware to ensure that he will get the best performance he can. Software questions are being handled increasingly by those who have training in a particular application, but right now there simply aren't enough people to go around. Hardware questions are dealt with in much the same way. Training in new products is an ongoing process, and Kayl is constantly looking at ways to streamline that process;

now the biggest bottleneck is managing the company's growth in terms of being able to service what gets sold in a timely fashion. Cutting down time on hold should be a major priority for Ray Kayl, because customers have found the service at the other end worth the wait.

CIRCLE 616 ON READER SERVICE CARD

Hewlett-Packard Co.

by Robin Bornstein



PC Magazine survey participants placed Hewlett-Packard's PCs at the very top of the list with a 96 for overall reliability—the highest score for any PC. Respondents to our survey are extremely happy with their HP computers, which they've told us are virtually indestructible. Problems are rare; only 27 percent of participants, compared with the overall 41 percent, said they had encountered any difficulty. When something does go wrong, the magnitude of the situation is extremely low; HP's score on problem severity was 32, compared with the average 45.

Overall, statistics and comments from our participants show they trust the Hewlett-Packard name. While only 80 percent

BULLETPROOF

Outstanding hardware durability and performance is the most noted aspect of HP's dedication to excellence. Henry Wojewski, an equipment service representative at Dynachem in Tustin, California, describes his Vectra RS25/C as "basically bulletproof. It hasn't given us a lick of problems. I expect Hewlett-Packard's products to be better than those from someone else, and my computer has met my expectations 100 percent."

Over the past seven years, Hewlett-Packard has been implementing reliability programs in an effort to improve hardware durability even further. "In order to have quality products, you must understand all the factors that relate to quality. Only by knowing where you stand today can you know where to improve," explains Lane Nonnenberg, group marketing manager for the worldwide customer support operation at Hewlett-Packard. Nonnenberg claims that HP has accomplished its "ten times better in ten years" goal in only seven years, according to data collected from service centers, dealers, and end users. With this goal achieved, the company is currently working on a new "ten in ten" plan.

Reliability is worth the extra expenditure you might have to make when purchasing a Hewlett-Packard PC. "A joke in the industry is 'Do you know what HP stands for? It stands for high price, but it also stands for high performance,'" says Jordan Davis, a systems development manager in Santa Clara, California.

HP's Nonnenberg acknowledges the existence of this public opinion, but points to an International Data Corp. survey, which shows HP's street prices to be lower than IBM's and Compaq's. Furthermore, he says, HP's cost of ownership is low. Indeed, the low percentage of respondents reporting a problem with HP's machines confirms his statement.

Hewlett-Packard's repair service received a high satisfaction score from our survey respondents (84 compared with the average 75). Dealers, according to Nonnenberg, are the primary means of end-user service. HP involvement with dealers ranges from full training and certification to third-party involvement (where HP travels to the dealership in order to service the PC).

Some respondents, such as Marty Macher, an engineer at Chem-Nuclear Systems Inc. in Columbia, South Carolina, complain about a lack of authorized

"My HP Vectra RS25/C is basically bulletproof. I expect HP's products to be better than those from someone else, and it has met my expectations one hundred percent."

quality control and standard procedures are also being revised.

Overall, Gateway's high marks bode well for the company's future, as does its commitment to customer service. Right

of the polled PC users reported that would buy again from the same manufacturer, an overwhelming 92 percent of the polled HP users would opt for another HP machine.

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dealers. But, Macher says, because of high reliability, service is rarely needed. HP's Nonnenberg acknowledges that there aren't many dealers, but is quick to point out that Hewlett-Packard itself "will always maintain a piece of equipment in these cases."

Users can call the Customer Information Center ((800) 752-0900) to locate the nearest authorized dealer as well as to obtain company and product literature. Contractual customers receive a bulletin board service (HP SupportLine). Contract options include 7-day, 24-hour service—with a 4-hour on-site response time!—or weekly on-site visits. New support programs in the past year include a question-and-answer facsimile auto-reply line for contractual customers ((208) 344-4809), an electronic news network, and dealer and tech hot lines.

Hewlett-Packard proves that a company can turn out quality product after quality product while maintaining strong contact with users. And while a Hewlett-Packard PC may be more expensive than many clones, outstanding reliability and support ensure that those extra dollars are well spent.

CIRCLE 617 ON READER SERVICE CARD

Hyundai Electronics

by Meredith Miranda Gadsby

COMPANY SCORES



166 Baypointe Pkwy.
San Jose, CA 95134
(408) 473-9200
(800) 678-6817 (sales)
(800) 234-3553 (technical support)

▼ Actual score ▲ Average score □ High-low range

Although known for low-end products in its early days, Hyundai has a reputation for producing reliable equipment that is reasonably priced for its class. Survey results show that the respondents found Hyundai's overall product line to be solid, giving it a score of 87 in reliability, very close to the average of 89. And Hyundai did fine when it came to repeat customers: 81 percent of those who responded for Hyundai would buy from the company again, as compared with an overall 80 percent. Hyundai also scored higher than average for satisfaction with technical support (72, compared with the average

SERVICE AND RELIABILITY DESKTOP PCs

score of 66) and with repair service (79, compared with 75).

Like most of Hyundai's customers, survey respondent Robert R. Gray, a United States pilot from Jemez, Nevada, is satisfied with his Hyundai PC. He recommends Hyundai units for their class and price. He says that he had only one

Hyundai Electronics

80286 models



▼ Actual score ▲ Average score □ High-low range

problem with a bad memory chip two weeks after receiving the system. The problem was taken care of quickly by his local dealer.

According to Gray, "It's as reliable as any computer I've ever owned. I've had Wyses and IBMs that have caused me more trouble."

But not all of Hyundai's customers are so pleased. Veronika Ramos, information systems coordinator in the Pima County purchasing department in Tucson, Arizona, complained, "In the 26 months we have owned the Hyundai 286c it has been out for repair a total of 45 working days.

She continues, "It will come back today from the shop where it has been for four weeks waiting for a chip to come from Hyundai." When she received the system after repairs, Ramos said she used it for about two days and then it went cold again.

PUSHED ASIDE

Nick Naimo, vice president of the operations group at Hyundai, admits to some past inefficiencies in the company's two-year-old service program, Return Material Authorization (RMA). According to Naimo, Hyundai's support services are usually provided through dealers or third-party service. "From time to time we tell customers to send products to Hyundai, which sometimes causes us trouble." Workers in Hyundai's warehouses used to rely on dealer account numbers to keep track of products for repair. If they were unable to find an account number or there were a problem with it, workers would put

the product to the side. "As a result," Naimo says, "we would have products in our warehouse that we didn't know were there until the customer called in about them."

To rectify this problem, Naimo says, the RMA program was revamped in January of this year. Instead of relying on dealer account numbers, the system has been transformed into a "check sum" system. After issuing the RMA, this new computerized system alerts the worker of a product's repair status. If the field is blank eight days after the RMA issue, a report will come up that alerts the worker in the warehouse to look for the product. This procedure is designed to ensure the speedy repair and return of all merchandise to the customer.

Because Hyundai is a manufacturer, Naimo recognizes that theoretically "all service is done to assist the dealer." However, "we do recognize that the end user will call the manufacturer," he says. For this reason, two people were hired in February in an effort to "take care of the end user" better, says Naimo. To accommodate the east coast end user, Hyundai has also expanded its service hours to 8:00 A.M. to 12:00 midnight, Eastern Standard Time.

Naimo is quite optimistic about his company's future performance in the areas of tech support and repair service. He urges his customers to look for Hyundai in 1990. "Two years ago we were the first company to introduce S. O. S.—Service On Site—at the affordable price of \$99 for 18 months. Watch us in 1990," he says. "We're gonna shake things up again... Watch us fly!"

CIRCLE 618 ON READER SERVICE CARD

IBM Corp.

by Mary Kathleen Flynn

COMPANY SCORES



Contact your local
authorized IBM dealer.
(800) 426-2468 (dealer information)

▼ Actual score ▲ Average score □ High-low range

DESKTOP PCs

They're happy, but not ecstatic. They've got problems, but solutions, too. They're loyal, but not fanatic. They're the IBM PC and PS/2 users who answered our survey. And making up nearly one-fifth of all respondents, they played a significant role in determining the averages for this section of the survey.

When it comes to IBM's performance, "average" is the word that says it all. On every significant survey question—reliability, problem incidence, problem severity, tech support, repair service, and customer loyalty—IBM's overall company scores were in the average range.

The results for IBM's individual products were almost as consistent. Every single IBM PC and PS/2 got average ratings on reliability and customer loyalty. Only occasional glitches in satisfaction with tech support and repair service marred the middle-of-the-road results.

MODELS 70 AND 80

Previous Editor's Choice winners, the 386-based PS/2s, Models 70 and 80, got average scores on reliability and average percentages of participants who said they'd go back to IBM. On the average, participants had used the Model 70 (introduced two years ago) for just under a year, and the Model 80 (introduced three years ago) for a year and a half—shorter than the average of almost two years that respondents had been using their 386s. The percentage of respondents who reported a problem with the Model 80 was average (41 percent) and better than average for the Model 70 (31 percent).

But the quality of tech support and repair service they received when they did have a problem disappointed our survey participants. The 351 readers who commented on the Model 70 and the 303 who commented on the Model 80 rated satisfaction with technical support below average (56 for the Model 70 and 62 for the Model 80, compared with the average 67 for 386-based systems). And Model 70 respondents judged satisfaction with repair service below average; they gave it a score of 66, compared with the average 74 for 386-based systems.

Despite the widely publicized problems with the Model 70-A21's motherboards, our survey found a below-average incidence of motherboard problems with the Model 70 (5 percent). Survey data on the Model 80, however, showed a higher percentage of motherboard problems: 13 percent of the Model 80 complaints were

attributed to defective motherboards, compared with 8 percent for 386-based PCs overall.

Survey participant Richard F. McBride,

financial planning specialist at Nuclear Fuel Services in Erwin, Tennessee, was one of the victims of the Model 80's motherboard problems. "In the first three months I had the Model 80," McBride explains, "I started to have problems with the hard disk and the controller card. Then the motherboard failed. The repairman came in, assessed the problem, and took the CPU back with him to the shop. He had to replace the motherboard entirely." Although McBride's dealer did well by him, turning the system around in only 24 hours, the experience has soured him on IBM. "I wouldn't buy from IBM again unless I were forced to," he says.

And other survey participants told us they had to wait over a month to get their Model 80s fixed when the motherboard failed.

MODEL 55SX

IBM's 386SX-based PS/2 Model 55SX, introduced a year and a half ago, fared similarly to its 386-based siblings. At the time of the survey, it had been on 80 respondents' desktops for an average of eight months—the same length of time as the average 386SX. The Model 55SX had held up well, with only 21 percent of the survey participants reporting a problem with it, lower than the 31 percent for SXs overall. Although the buy-again results were average compared with all PCs, they were low for 386SX-based systems: 81 percent said they'd buy again from IBM, compared with the 80 percent average for all systems and the 88 percent average for all SX-based PCs.

Like the more-powerful PS/2s, the Model 55SX disappointed respondents on tech support; it scored 57, lower than the average 65 for SX-based machines. On repair service, however, the 55SX got a score of 77, comparable with the average 74.

MODELS 30 AND 50

The 286-based Model 50, introduced with the other original PS/2s three years ago, had been in use an average of just under two years—seven months less than the average 286 on our survey. The Model 50 elicited 388 responses. Its scores were in line with the Model 55SX's, except for one improvement. The percentage of participants who indicated a problem with it was even lower—only 29 percent complained, compared with 42 percent for 286s overall.

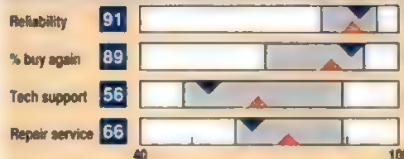
The problem incidence for the 8086-

IBM Corp.

PS/2 Model 80 (80386)



PS/2 Model 70 (80386)



PS/2 Model 55SX (80386SX)



PS/2 Model 50 (80286)



PS/2 Model 30 (8086)



IBM PC AT (80286)



IBM PC-XT (8088)



■ Actual score ▲ Average score □ High-low range

DESKTOP PCs

based Model 30 was better still, with only 25 percent of the respondents reporting troubles. 269 participants have been using the Model 30 (introduced three years ago) for an average of 19 months—shorter than the more than three years of use for the average 8086/8088-based PC.

PCS AT AND XT

The classic AT was rated average on all but one survey question: satisfaction with tech support, which got a score of 60, below the average score of 66 for 286s. Now five years old, the AT had been on 361 respondents' desks for three and a half years on the average (over a year longer than the average 286-based PC).

According to our survey, the six-year-old XT has held up remarkably well. Its scores were average across the board—even though 378 respondents reported having used the XT for an average of almost four years, about a year longer than the average 8086/8088-based system.

THE ORIGINAL PC

IBM's original PC, introduced nine years ago, inspired comments from 378 survey respondents who'd used it over five years on the average. These participants gave the PC a score of 96 for overall reliability—the highest of any IBM machine. An average 41 percent of the respondents reported problems, to which they gave a below-average severity rating of 38. Original PC respondents were happier with the service and support they'd received from Big Blue than any other group of IBM customers who responded to our survey; they gave tech support a score of 68 and repair service a score of 84.

Survey respondent Stephen D. Hall, an attorney with Peterson, Moss, Olsen, Meacham & Carr in Idaho Falls, Idaho, told us his international tale of solid service for his PC. "I bought my IBM PC with two floppy disk drives in July of 1984 because I knew I'd be living overseas, and I thought I'd get the best support with an IBM machine. And when I was living in Puerto Rico, I did have a problem with the motherboard. Considering that I was living in Puerto Rico, I got really good service; it came back within a week with a new motherboard."

DEALER RELATIONS

Since 1981, when it launched the original PC, IBM has sold its personal computers through two distribution channels: a direct sales force for large corporate ac-

counts, and authorized dealers for end users. Corporate customers get support directly from the National Service Division. End users get support primarily from the dealer, with IBM exercising some control over that support.

According to L. D. Deaton, IBM's director of marketing support at the National Distribution Division, "IBM's philosophy is that service and support should be available to the customer from the point of purchase. That's why IBM requires all authorized dealers to staff at least two trained technicians and to maintain a repair facility. We also publish a list of recommended—they used to be required but now they're recommended—spare parts to stock."

The primary vehicle for dealer feedback these days is IBM's Service Advisory Council, which, like Compaq's Executive Council, is made up of executives from dealers across the country. According to ComputerLand's Waas, Big Blue is all ears: "Now IBM listens very carefully to the needs and requirements of the dealer channel. It's not a one-way conversation anymore—it's a two-way dialogue." And like Compaq, IBM provides a toll-free tech-support line for dealers, which, Deaton says, was recently improved to answer urgent calls live.

WHAT THE USER GETS

What this means for the end user is that no matter who your IBM authorized dealer is, you can get on-site service should you want it.

"I'm tired of training dealers' service people. You get a good one, and he's gone in a year or two. IBM keeps its people up to date, and they've done a heck of a good job servicing my machines."

About 18 months ago, IBM launched a program it calls the Service Partnership, which was designed to create a closer relationship with dealers and to augment dealers' service offerings where appropriate. According to IBM's Deaton, the Service Partnership "provides support where the dealer can't meet customer needs because of location, staffing, whatever. The dealer has a choice of letting IBM handle the maintenance agreement, in which case IBM pays the dealer a percent of the contract, or of reselling IBM's service." A warranty upgrade—from customer carry-in to on-site service—and a maintenance agreement to cover service needs beyond warranty are sold to dealers, who in turn sell them to the end user.

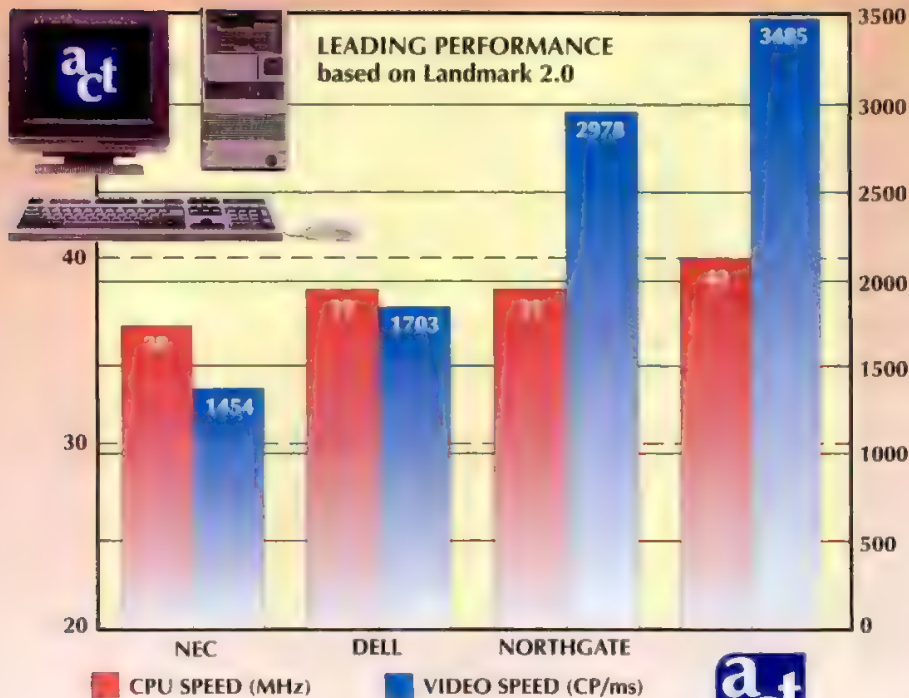
Bill Waas, vice president of service for ComputerLand Corp., "can't speak highly enough about the direction IBM has taken." Before the Service Partnership program, Waas recalls, "there was a good deal of contention between IBM and its dealers because of channel conflict. But since then, IBM has gone to great lengths to eliminate that conflict as much as possible, and the situation has totally flipped."

For some survey participants, that makes a big difference. Philip Paulson, LAN manager for Sycamore, Illinois-based Genoa Business Forms, says he's "decided to go True Blue all the way." A Compaq Deskpro 286 owner himself, he now buys only PS/2 Model 70s for the two dozen nodes on Genoa's network. "Service," he says, "is the reason for this decision." After years of frustrating experiences with poorly trained technicians from dealers, he's opting for IBM's on-site warranty upgrade: "I'm tired of training dealers' service people. You get a good one, and he's gone in a year or two. I just don't want to get stuck with some computer store's flunky. IBM keeps its people up to date, and they've done a heck of a good job servicing my machines for the past nine months."

For large accounts, IBM offers even more: its new End User Support Program provides telephone tech support for a monthly fee, starting at \$30 per system for 25 CPUs. "The tech support personnel are trained in PCs, PS/2s, clones, and Apple systems, as well as in most software applications," says George Beada, program manager of complementary services. "The End User Support

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CIRCLE 476 ON READER SERVICE CARD



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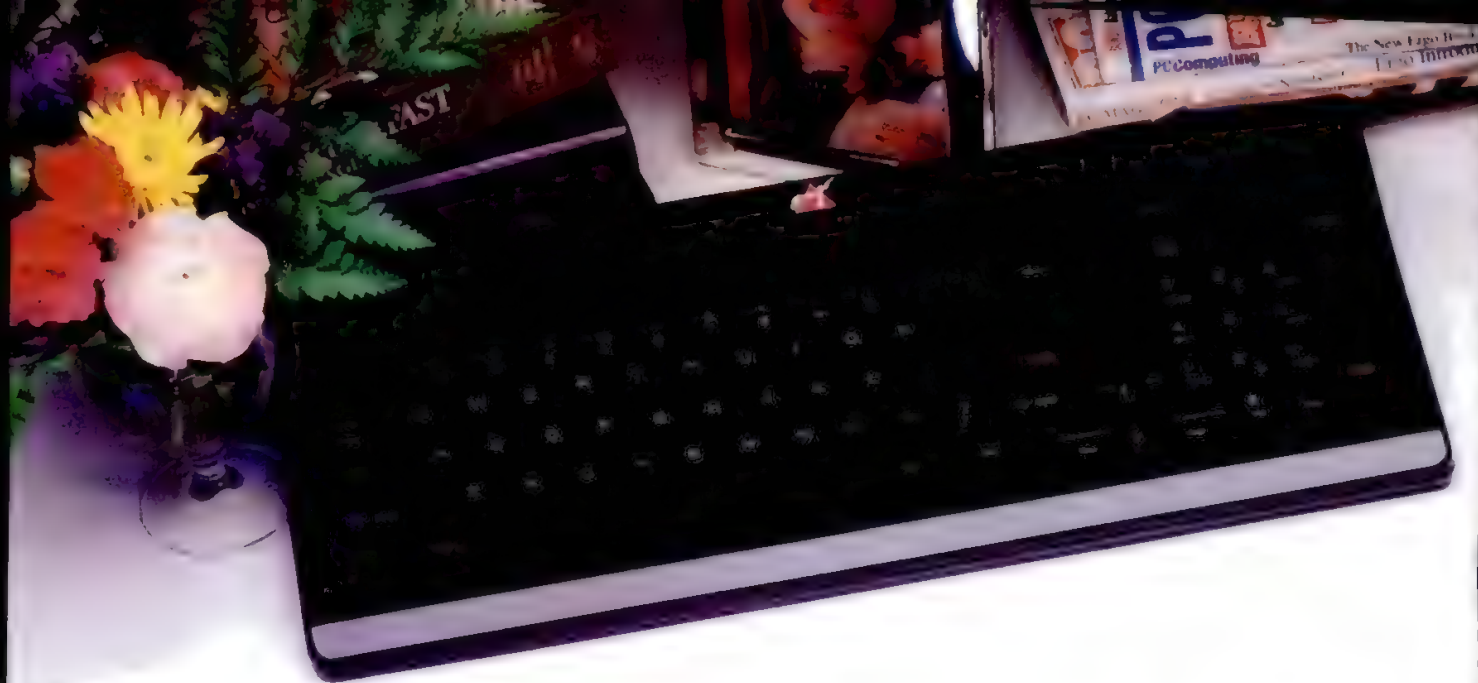
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CIRCLE 479 ON READER SERVICE CARD



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high memory, and still leave the lower 640k free. The regular Brick shown above also accepts an internal ISA 16-bit half length card, while the "Stretch Brick," shown at right, accepts one full and one half length card.

Great Value

Complete Brick systems start at just \$2,495. For your convenience, we also offer pre-installed software packages – including the DESQview™ or the new Windows® 3.0 environments – and top-rated applications. For example, the system (shown above) including all standard Brick features with optional color VGA monitor; 4 MB RAM; and a 100 MB hard disk pre-programmed with DESQview 386, Quattro®, Sprint®, askSam™, DOS™ and Tree86™ is only \$3,995! With this package, we also include our exclusive interactive "Talking

"Tutorial" that quickly teaches you how to use each program. Yes, the Brick actually talks.



Optional paper white VGA LCD display with back-lit super twist technology.

Guaranteed Satisfaction

Because we are a direct selling manufacturer, we have a direct interest in the complete satisfaction of each and every customer. To ensure that satisfaction,

Ergo offers: a 30-day money back guarantee, a One Year Warranty, unlimited 800-line support and our exclusive Advanced Diagnostics via modem.

Free Catalog

You'll find complete information on all Brick systems, plus a full complement of enhancements including FAX and networking cards, tape backup unit, cases, monitors and more in our 32-page catalog. Why not call for it today?

Ergo also offers a line of traditional 386 computers, from 16 to 33 MHz, starting at just \$1,895. Call us at 1-800-633-1925 and we'll help you select the system that best meets your needs.



\$2,495

System Includes

- ▲ Stretch Brick
- ▲ 16 MHz Intel 386sx
- ▲ 1 MB RAM, Exp. to 8 MB
- ▲ 40 MB hard disk with password protection
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Standard Features

- ▲ 1024 x 768 VGA controller with 1MB video RAM and EGA, CGA, MDA support
- ▲ 101 keyboard
- ▲ 2,400 bps modem
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Peabody, MA 01960

DESKTOP PCs

Program provides a one-stop tech support, not just IBM-specific support."

With the recently announced PS/1, IBM is delving even further into end-user support, providing on-line services and a toll-free tech-support line to the home audience it hopes to capture. (See "IBM's PS/1 Removes the Hassles and Delivers Decent Performance for Beginners," in the August 1990 issue.) But there's no indication that IBM will extend this type of service to its business customers.

Survey participant and PS/2 Model 70 owner Charles Paul de Young sums up the feelings expressed by many IBM customers interviewed for this story. A computer consultant in Rock Hill, South Carolina, de Young travels three days a week, lugging his Model 70 (which he bought before the Model P70 386 came out) with him. "Buying an IBM is like buying a Mercedes," he says. "You put out a lot of money up front, but it's worth it for the lasting value and reliability you get in return."

CIRCLE 619 ON READER SERVICE CARD

Kaypro Corp.

by Ann Sherman

COMPANY SCORES



2052 Corta Del Norgal
Carlsbad, CA 92009
(619) 431-1588

▼ —Actual score ▲ —Average score ■ —High-low range

Kaypro computers have earned much admiration among the 123 survey respondents who use them. These machines have lasted a long time and served their users well. So why did only 54 percent of them say they'd buy from Kaypro again (a much smaller base of repeat customers than the 80 percent overall for this question)? The answer lies in uncertainty about the company itself. But according to Kaypro, this will change very soon.

Founder and chairman Andrew Kay met with early success in the 1970s, building PCs that ran the CP/M operating system. The company switched to DOS-based machines in the early 1980s. But during

the last six years, Kaypro has struggled against increasing financial snares and watched as a slew of clone manufacturers ate away at its niche in the market. Finally, Kaypro filed Chapter 11 in April of this year.

Despite its rocky corporate history, Kaypro has manufactured good desktop

"For my next computer, I'll need a larger company than Kaypro—one that I know will stand behind its machines, one that has great service."

machines. Respondents rated the overall reliability of these workhorses at a score of 90—average for all PCs. And 47 percent of respondents indicated having had problems with their Kaypro systems in the last year—slightly higher than the 41 percent overall. But Kaypro respondents' machines are older than most; participants had used their Kaypro systems almost twice as long as the average PC included in the survey.

Respondents focused their disenchantment not on the machines, or even so much on dealers—the source of Kaypro distribution—but rather on Kaypro support. While Kaypro's overall scores for satisfaction with technical support and repair service were average (63 and 75, respectively), respondents rated technical support that came directly from the manufacturer at a very low 36 and repair service that came from Kaypro itself at 34 (far below the average rating of 67 for both categories).

Typical of Kaypro respondents' sentiments were those of Elwood Padgett, a project engineer with General Electric Co. in Arlington, Virginia. Of the three-year-old Kaypro PC he uses at home, Padgett says, "I bought it after a good experience with my Kaypro CP/M system. The PC is very reliable and solid—built like a tank." Aside from a faulty disk drive discovered early, Padgett has had no problems with the machine.

However, he wouldn't buy from Kaypro again because the company's relationship with its customers is "terrible." According to Padgett, "The documentation was poor, and Kaypro maintains no correspondence with registered owners; I had to find out about new models only through ads. Furthermore, Kaypro

had promised plug-in processor upgrades; the machine was to be the 'last computer I would ever need to buy.' But the company never followed through with the idea, and cards from other vendors didn't fit my machine."

Another factor that discouraged respondents was the company's response to problems. While Andrew Kay affirms that his company maintains "24-hour techni-

cal service and support," 52 percent of respondents were unaware of a hot line. Of the 15 percent that did use the service, 33 percent were not satisfied—a figure four times as great as the 8 percent average!

David L. Riggs, the owner of Riggs Enterprises in St. Augustine, Florida, says it was "customer support and service that has turned me away from Kaypro." When he needed information about how to install a new video board that Kaypro itself had sent him, the staff was "arrogant and unhelpful. I could find no 800 number and they put me on hold for 20 minutes. When I finally got through, they couldn't even give me the information I needed," he says. "Another time, I wanted to install a new hard disk, Kaypro said 'just put it in,' but it wouldn't fit; the staff had no suggestions. In addition, the literature wasn't up to date, and it was not even for my system."

ROCKY ROAD?

Yet another set of customers never had a problem with their machines and never expected anything from Kaypro. But neither would they turn to Kaypro again because of the company's instability. For example, J. Kevin Colligan, an assistant project director with the Mathematical Sciences Education Board in Washington, D.C., has had his Kaypro 286i for about four years: "I've had next to no problems with the machine; it's met all my needs. But for my next computer, I'll need a larger company—one that I know will stand behind its machines for more than a year and one that has technology upgrades and great customer service."

Caught in the mire of court battles and creditors, Kaypro is restructuring. After a

Dell™ PC wins the 1st PC Week Corporate Satisfaction Poll.



286 Systems, October 17, 1988

Dell PC wins the 2nd PC Week Corporate Satisfaction Poll.



386™ Systems, October 24, 1988

Dell PC wins the 3rd PC Week Corporate Satisfaction Poll.



386 Systems, April 10, 1989

Dell PC wins the 4th PC Week Corporate Satisfaction Poll.



286 Systems, April 17, 1989

Dell PC wins the 5th PC Week Corporate Satisfaction Poll.



386 Systems, February 5, 1990

Dell PC wins the 6th PC Week Corporate Satisfaction Poll.



386SX Systems, February 12, 1990

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386SX Laptops, July 16, 1990

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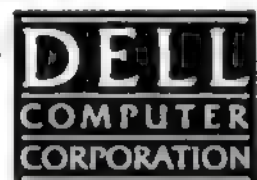
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DESKTOP PCs

brief period during which operations were halted, the company has once again started production, filling a backlog of orders as well as new orders in excess of \$1 million. Newly appointed president and CEO Ben Fisher was able to address the problems Kaypro respondents raised. "Many of our problems—including those with technical support—were related directly to our financial crunch: the staff was greatly reduced in size.

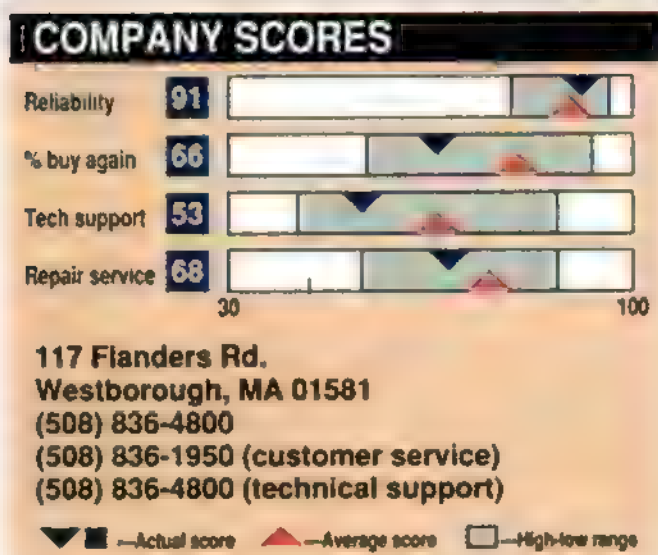
"The machines were not well documented. We admit that and promise to change things once the company is on its feet again. As for our relationship with the customer, information about new products was discontinued when we discontinued our magazine, *Profiles*. We plan to address that issue as well, but right now our primary concern is shipping products." He continues, "A new 386SX machine is on the verge of production, and we will be shipping more-complete systems than we have in the past. As for quality, our engineering department functions the same as it always has. It has been reduced in size, so we are delivering fewer distinct types of products. But the equipment we are shipping is of the very best quality."

There's no question that Fisher has his work cut out for him. But if he can provide support and security that are as solid as his systems, there's a satisfied customer base out there, just waiting to be lured back to the fold.

CIRCLE 620 ON READER SERVICE CARD

Leading Edge Inc.

by Sharon Terdeman

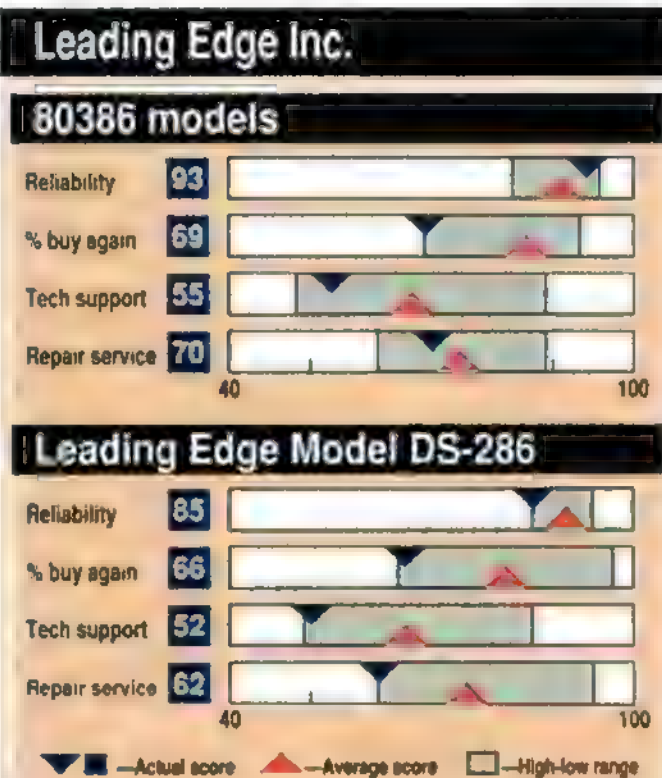


Three years ago, Leading Edge held a large share of the PC clone market, achieved mainly through extremely competitive pricing. But early last year its pricing strategy backfired, and the com-

pany entered Chapter 11. Last October, Leading Edge merged with Daewoo Corp.—the Korean industrial giant that had supplied its computers—and now it hopes to establish itself as a force in the PC marketplace again. But it faces an uphill struggle.

WAIT AND SEE

Survey participant Patrick Farrell, a civil engineer with the New York State Thruway Authority, is "very happy" with his Leading Edge computer, but that doesn't mean he'd purchase another. "I found the computer to be exceptionally reliable, a lucky thing since support was so poor. I'd have to wait and see whether things will



improve now that it's merged with Daewoo, whether the company will be around for a while."

Farrell's perspective mirrors the results of our survey. Respondents have had their Leading Edge machines for a long time—almost three years on the average, compared with 21 months for all PCs. Overall reliability of Leading Edge computers scored about average (91 versus 89). But satisfaction with customer support is well below average (53 versus 66). Survey respondents are very much aware of Leading Edge's reorganization and have adopted the same wait-and-see attitude expressed by Farrell.

As David Manion, section manager for Computer Sciences Corp., said, "A few years ago, PCs were mostly desktop toys, and we bought cheap clones. Maintenance was a problem, but it didn't matter so much. Now we're all networked and these machines are critical to our work.

So, although price is a factor, perceived reliability is most important. We'll probably go with a brand name next time."

Perceived reliability seems to include the reliability of the company itself. Will it be there? Will it be responsive? And is Leading Edge still a brand name, with all that implies not only about consumer recognition, but also about product quality and the durability of the company?

Craig Conrad, director of marketing communications for Leading Edge, believes that it is. Even before he heard the results of our survey, he understood that the company had a problem with the way customers perceived its support and service. But Conrad is enthusiastic about the new Leading Edge, and optimistic about its future. He described what seems a serious effort toward regaining the company's position in the market.

Prices will still be very competitive. The company intends to control distribution of its products tightly in order to avoid an oversaturation of dealers in a particular area. To that end, it has engaged Sofsel/Microamerica, one of the largest computer products distributors, as its exclusive national distributor. Sofsel/Microamerica will service regional distributors who in turn will service resellers. These resellers will have to be site- and service-authorized.

Leading Edge has also stated a commitment to service and support, which includes a 20-month warranty on desktop computers, a dealer certification program requiring dealers to support end users, and a significant investment in domestically available spare parts. Users will have the option of contracting with GE Computer Service for on-site maintenance.

Leading Edge is directing its current marketing efforts toward mid-size growing companies—which the company defines as those that need to make a significant investment in computer equipment, but where price is still a real consideration. In addition, there is an installed base of some 800,000 Leading Edge computers, now ripe for replacement. If the company can instill a renewed interest and confidence in its products and in its service programs, this ready-made market may provide a new entrance into the corporate world.

That is the big question. Current advertising identifies the company as the "new Leading Edge." Will it be able to convince brand specifiers that the reorganization is substantial enough to warrant vol-

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An even better value at these low prices.

STANDARD FEATURES:

- Intel® 80386 microprocessor running at 25 MHz.
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- Advanced Intel 82385 Cache Memory Controller with 32 KB of high-speed static RAM cache.
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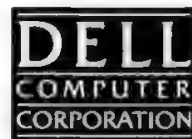
Who are we to argue with the experts.

The leading computer publications in nine countries, including all the major ones here in the U.S., have voted the Dell System® 325 the number one, or one or uno 25 MHz 386™ based personal computer in their respective markets.

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Best of all it's from the company that finished #1 in customer satisfaction, 6 out of 6 times in *PC Week* polls of corporate volume buyers for PCs.



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CIRCLE 532 ON READER SERVICE CARD

DESKTOP PCs

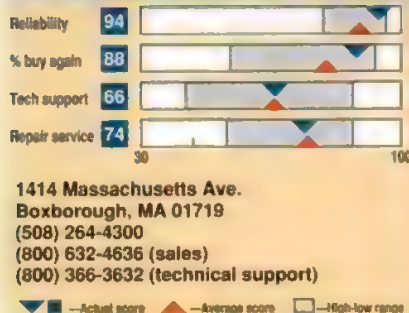
ume sales? Like the participants in our survey, we'll wait and see.

CIRCLE 621 ON READER SERVICE CARD

NEC Technologies Inc.

by Sharon Terdeman

COMPANY SCORES



NEC Technologies, an affiliate of the \$24 billion NEC Corp., markets a wide range of computer, peripheral, audio/video, and home entertainment products. It may not be in the same league as IBM or Compaq, but there's no doubt that NEC has a well-established position in the next tier of the personal computer market. And with good reason.

For overall reliability, our survey respondents rated NEC extremely high; with a score of 94, NEC came in second only to Hewlett-Packard, which scored 96. Again and again, respondents cited price/performance issues and a reputation for reliability that led them to purchase NEC computers in the first place, and their own subsequent experience with these computers that encouraged them to buy more. (For some respondents, this included spending their own money for an NEC machine at home.)

Marcel De Rycker manages the University of Hartford's Barney School of Business's Information Technology Center. Two years ago he set up a computer lab to instruct students. "At first we had the idea to go with IBM, but we had a budget. We did a lot of research and in terms of the price/quality ratio, NEC couldn't be beat," he says. De Rycker continues to be pleased with his purchase. The lab consists of several NEC Powermate 286s linked in a local area network with an NEC 386 file server. Says De Rycker: "These machines are turned on and off 40 to 50 times a day—not the

easiest life for a computer. And so far we haven't had a single hardware problem!" He's been so impressed with the NEC computers that he's recommended their purchase to several offices as well.

AROUND THE CLOCK

Jerry Zimmer, senior engineer with Exabyte Corp., echoes De Rycker's satisfaction. "As the manager of systems engineering at Synergetics in Boulder, Colorado, I installed NEC Powermate 286 systems in several remote locations. These machines are on 24 hours a day, seven days a week. They sit there and collect data on weather or water conditions," he says. "We've had these machines in service from 24 to 36 months and have never had a service call of any type on any of these systems. I'm very impressed."

These NEC customers are by no means isolated. Survey responses were overwhelmingly similar: people bought NEC's computers because of its reputation for reliability and because it provided the best value. And they intend to buy from NEC next time around; 88 percent of the respondents said they would buy from NEC again—higher than the 80 percent of our respondents overall who would buy from the same manufacturer.

NEC Technologies Inc.

80386 models



80286 models



When it came to satisfaction regarding service and technical support, NEC's scores were respectably average. NEC feels that only its authorized resellers can provide the level of service that its customers deserve; therefore, an important component of the research you do before buying an NEC computer should be an evaluation of the level of support you can

expect from your vendor.

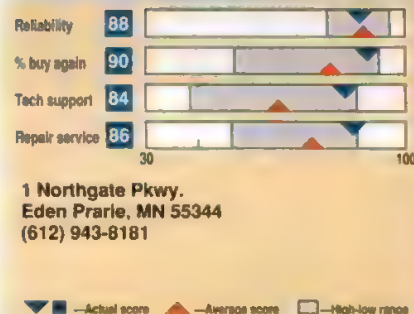
So, on the basis of our survey, should you buy NEC desktop computers? The answer is clear: in terms of overall reliability, you couldn't do much better. And if you take the extra step and check out dealers beforehand, you'll go a long way toward ensuring that any problems that do occur will be resolved.

CIRCLE 622 ON READER SERVICE CARD

Northgate Computer Systems

by Kellyn S. Betts

COMPANY SCORES



The most intense competition for the top service honors across our survey's four most important categories is among the three big mail-order houses: Dell, Northgate, and Swan. If you look at the straight numbers alone, the ratings in Northgate's company score box put it slightly behind the other two, giving it the third-highest overall service ratings of all PC vendors. But a more careful examination shows the performance of all three companies to be comparable. Furthermore, if you consider the number of responses to be something of a popularity contest, Northgate wins, with 826 responses to Dell's 787. Swan trails far behind with only 94 responses.

FANATICAL FOLLOWING

If you're looking for the subjective winner for customer loyalty, Northgate takes first prize. We've never seen such zeal for a company as we did for Northgate throughout the survey responses and follow-up interviews. And, backing up their fanaticism, 90 percent of the Northgate respondents plan to return to the mail-order house for their next purchase—much higher than the 80 percent figure for all PCs but comparable to the 91 percent who said they'd buy again from Dell and the 93

AN EVEN SMALLER PRICE TO PAY FOR GREATNESS.



THE DELL SYSTEM 310 20 MHz 386.

The best combination of performance and value available in its class.

STANDARD FEATURES:

- Intel® 80386 microprocessor running at 20 MHz.
- Standard 1 MB of RAM, optional 2 MB or 4 MB of RAM* expandable to 16 MB (using a dedicated high-speed 32-bit memory slot).
- Advanced Intel 82385 Cache Memory Controller with 32 KB of high-speed static RAM cache.
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40 MB VGA Monochrome System	\$2,999
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PC Magazine described the Dell System® 310 as the best price performance package on the market.

We've now lowered the price, which makes it an even better package.

The Editor's of PC Magazine also described the Dell™ 310 as being "Fast enough to burn the sand off a desert floor." Now, that's some performance.

Which we think, makes it the best 20 MHz 386™ PC on the market.

That's why the Dell 310 easily outperforms the Compaq DeskPro 386/20e and the IBM PS/2 Model 70-121 on both the MIPS Test and the Norton Computing Index.

And leaves them cold when it comes to price. Whether you buy or lease.

A price that includes a full 30-day satisfaction or your money back guarantee, one-year limited warranty, toll-free technical support, and next-

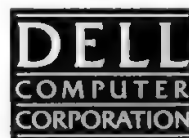
day, on-site service from Xerox Corporation.△ As well as the most comprehensive documentation in the business.

And if you consider that the Dell 310 comes from the company that's finished #1 in customer satisfaction 6 out of 6 times in PC Week polls of corporate volume buyers for

PCs, then the price you see above is a small one indeed to pay for greatness.

So give us a call and we'll tell you more about how you can own the Dell 310.

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CIRCLE 527 ON READER SERVICE CARD

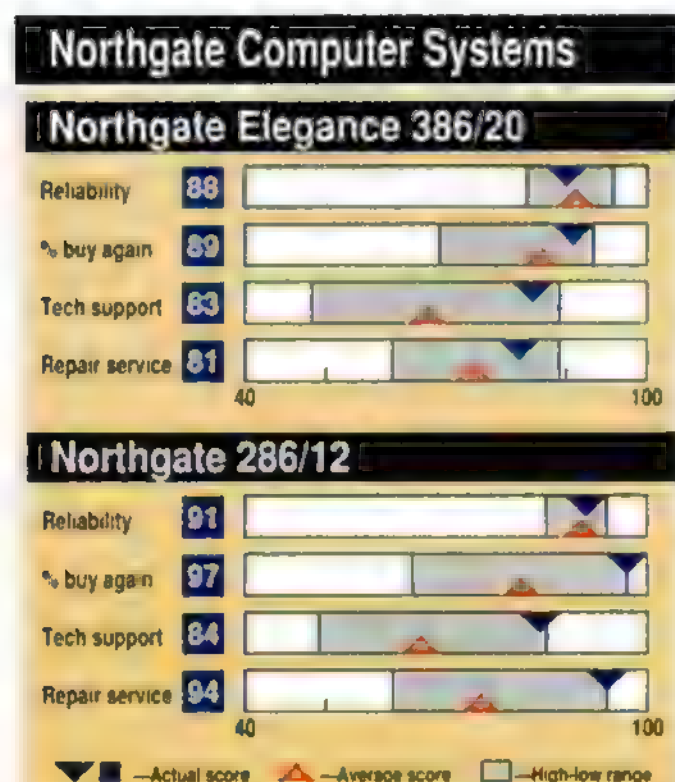
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DESKTOP PCs

percent who said they'd go back to Swan.

For overall reliability, respondents gave Northgate PCs an 88—comparable to the 89 average and the 92 Dell and Swan each received. And survey results show satisfaction with technical support to be very high: Northgate scored 84, well above the average 66 and comparable to Dell's 86 and Swan's 87. Satisfaction with repair service was equally good; Northgate



scored 86, much higher than the average 75 and virtually the same as Dell's 85 and Swan's 87.

ONE-UPMANSHIP

But Northgate is not content to rest on its laurels, which include four Editor's Choices. The company began improving its service a year and a half ago by offering policies seemingly designed to outdo the competition. While Dell doesn't pay for the shipment of repair parts and/or service shipping, both Swan and Northgate pay to ship the item one way. And Northgate one-ups Swan by always sending the product back by whatever method the user did. Northgate's 24-hour technical lines, which are operated by 140 full-time and 40 part-time staffers, are open twice as long as either of the other's.

All three companies include on-site service in their year-long warranties: Northgate's comes from Bell Atlantic (formerly called Sorbus), Dell's from Xerox, and Swan's from TRW.

PERSONAL TOUCH

Like Dell chairman Michael Dell, Northgate's chairman Art Lazere communicates personally with many of his customers by bulletin board: Lazere claims he spends "two to three hours a day on

CompuServe." He's also frequently on PC MagNet.

Sometimes, Lazere himself handles a particularly thorny tech-support problem by phone. For example, survey participant and TWA pilot John Legg (who was interviewed for the Compaq review in this section) was having trouble installing a tape drive in his new Northgate 386/20. When the tech support staff couldn't solve the problem for him, he sent Lazere a message on CompuServe. Lazere replied, encouraging Legg to call him personally if further suggestions didn't help. The next day, Legg took Lazere up on the offer, reaching the mail-order chairman quite easily through the sales phone number. "When the head of a company listens to customers like that," Legg says, "they must be doing something right."

But Northgate, like its competitors in the mail-order business, may need to try harder: 49 percent of the survey respondents reported experiencing a problem with their Northgate PCs in the last year. That's higher than the 41 percent overall. Swan fared exactly average, with 41 percent on this question. Dell fared comparably to Northgate, with 48 percent of respondents reporting a problem with Dell's PCs. In general, mail-order houses had a higher incidence of problems: like Dell and Northgate, CompuAdd, for instance, had 50 percent of the respondents reporting a problem.

The worst Northgate culprit was the company's 386/20. Our survey showed 52 percent of the respondents complaining of a problem with this unit in the

no avail. Northgate's tech support was very good, and after six months it replaced the entire system. Since then, everything works great and my confidence is back."

Dunning wasn't the only survey respondent to complain about what seemed an inordinately large number of problems with one machine. But like most of Northgate's customers who participated in our survey, he was satisfied with the company despite numerous problems with his system.

POWER DOWN

Our survey results indicate only one common thread behind the reason for problems: Northgate power supplies were more likely than those of other companies to burn out. This was true across Northgate's product line, though it occurred most with the company's 386/16s and 286/12SMs.

The experience of Peter Vagt, a project manager at Warzyn Engineering in Illinois, was typical: "The power supply went out on my 386/16 machine. I called the hot-line number and received a new power supply the next day, with instructions to return the old one. The next week, the computer occasionally wouldn't boot until a second turn off and on. I called Northgate, and a new hard disk arrived the next day. Now it works."

Most impressively, 97 percent of the present users of the 286/12SM said that they'd buy the same brand again, which no doubt bodes well for Northgate as more than half of the respondents using these machines told us they planned to replace them within two years.

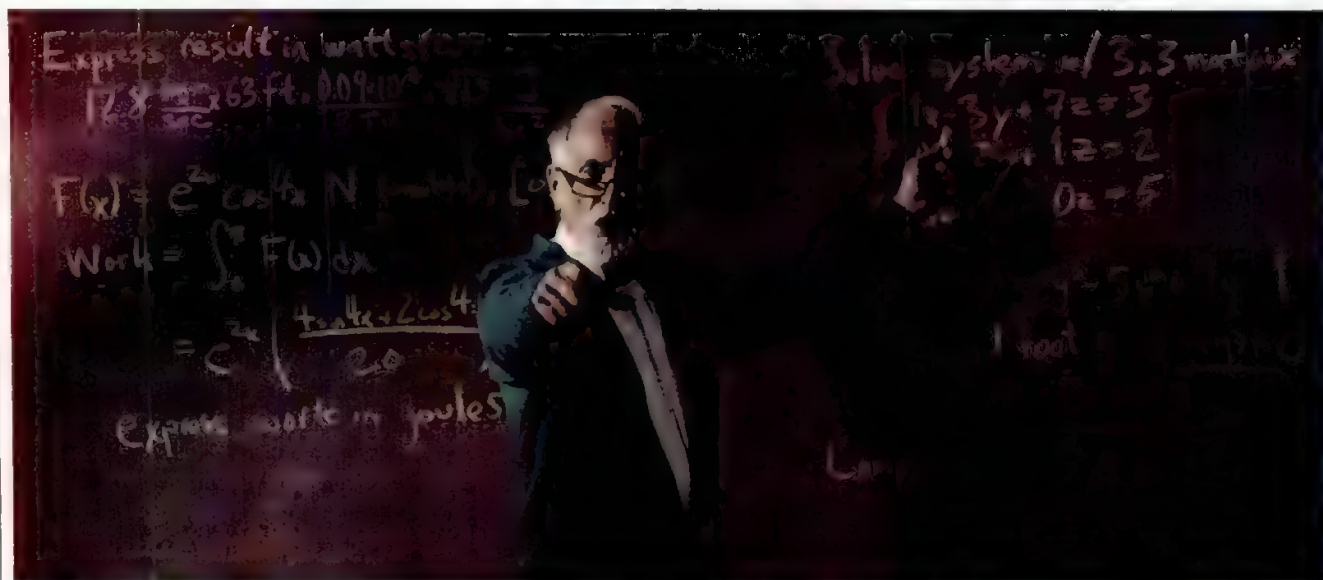
Glenn Cutler is a typically happy 286/

Northgate chairman Lazere communicates personally with customers, spending "two to three hours a day on CompuServe."

preceding year. "The original Northgate 386/20 PC never ran right from the beginning," said survey participant Philip S. Dunning, the owner of Dunning Research. "No one thing was really serious. Examples of problems were that ports wouldn't work, speakers wouldn't work; floppy disk drives would not read good disks at times and were very slow; the tape backup drive was erratic and unreliable. We tried replacing the motherboard, Adaptec controller, and tape drive—all to

12SM user. The PC coordinator for the 80 PCs used at New York City-based Consultants and Designers Inc., Cutler called upon Northgate's technical support staff to help him work around the "small compatibility problems" he had trying to use a serial Microsoft mouse with the first 286/12SM he purchased. He said he found it easier to deal with Northgate than Microsoft, and although the problem reportedly turned out to be with the Microsoft driver, it was Northgate that got a newer

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March 14,
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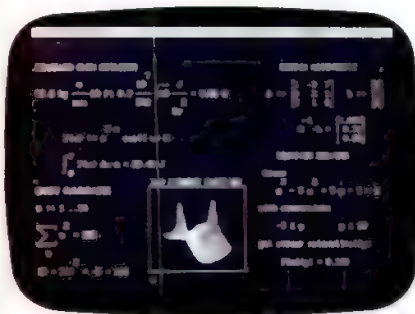
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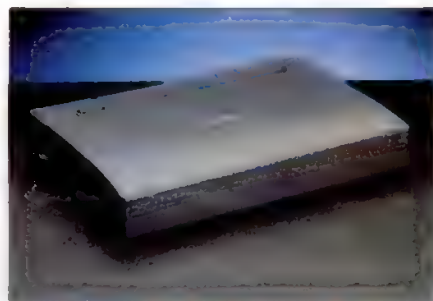
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DESKTOP PCs

version of it to him. As of August 1989, Cutler's company began buying only Northgates; it has five so far.

According to the responses we received, what really sets Northgate apart is the lengths to which the company is willing to go to please its customers. Allen Larkins, a senior photographer at the Delco Moraine NDH Division of General Motors in Ohio, said he originally bought an Editor's Choice 386/25 and installed a Truevision Targa-32 in it.

"The Targa-32 was not compatible with the 12.5-MHz bus in this machine," he said. "Northgate solved the problem by replacing the machine with a 386-33 at no charge to me."

That's but one of many tales of how hard Northgate tries to please. As chairman Lazere put it, "We knock ourselves out to serve our customers, and I hope it shows." It does. Watch out, Dell and Swan.

CIRCLE 623 ON READER SERVICE CARD

Packard Bell

by Susan G. Thomas

COMPANY SCORES



9425 Canoga Rd.
Chatsworth, CA 91311
(818) 773-4400
(800) 733-4411 (technical support)

Legend: ■ Actual score ▲ Average score □ High-low range

Packard Bell has done its marketing well. The company's current slogan—"America Grew Up Listening to Us. It Still Does"—advertises the old name that buyers trust. And it makes customers nostalgic for the good, old-fashioned reliability of the Packard Bell that made its radios in the 1920s and television sets in the 1950s. But it isn't really the same company. In 1970 the original Packard Bell had begun to fizzle financially, and that's when CEO Beny Alagem took his cue. He purchased the Packard Bell name in 1985 and began to market PCs, using Packard Bell's reputation for dependability to bolster that of his new company.

Today, Packard Bell makes competitively priced PCs, from \$800 for a basic

XT compatible to \$5,595 for a 25-MHz 386. Based on our survey, Packard Bell's PCs are dependable. Results show Packard Bell in a comfortably average position for reliability, customer loyalty, and repair service satisfaction, with its 80286 models slightly above average for repair service. Included with Packard Bell's one-year warranty is four months of free on-site service (which was upgraded as we went to press).

One glitch did appear, however. Packard Bell scored a low 57 for technical support, compared with the average score of 66 for PCs overall. Our survey revealed that Packard Bell customers depend on the manufacturer for technical support more than customers of any other PC manufacturer. Yet Packard Bell came in significantly lower than average for customer satisfaction with technical support that came directly from the company: while the average score for support from the manufacturer itself was 67, Packard Bell slouched at 51. What seemed to be the problem?

NOT-SO-HOT LINE

Packard Bell's technical-support hot line is a toll-free, voice-automated system designed for efficiency. Calls are categorized electronically so that by the time you actually talk to a person, you're talking to the right one.

But the hot line seemed anything but efficient to some survey respondents. John Howlett, manager of information services in the engineering division of Eagle Technology in Damfries, Virginia, called six times over an eight-day period trying to report the first problem with his 16-MHz machine; it took ten to twelve days to register his second.

"It was frustrating," Howlett said. "There is nothing in the system to register repeat calls, and if you make a mistake on your touch-tone, you have to start all over again in the queue. It assumes that the caller has an unlimited amount of time to spend on hold." Howlett did say, however, that "once you do get through, the technicians are helpful and competent."

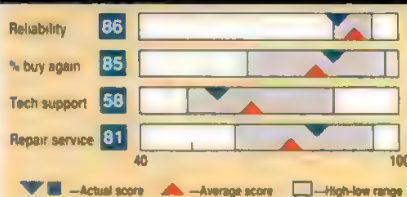
"A horror is what it was," declared Art Camiolo, referring to Packard Bell's hot line. Camiolo, president of Broad Based Communications in Sewell, New Jersey, spent a week talking to voice automatons before he could relay his problem to a Packard Bell technician; when he

finally did make contact with one, he was told that someone else would have to call him back. "After ten days the person who called was very knowledgeable and resolved my problem in a matter of minutes," Camiolo said, chuckling at the irony. "It was just ridiculous that I had to spend that much time on the phone trying to find him."

Norman Feldstein, a dentist who runs his private practice in Pittsburgh, Pennsylvania, also had difficulty with Packard Bell's hot line and said, "I think my problem is common. Lots of people, espe-

Packard Bell

80286 models



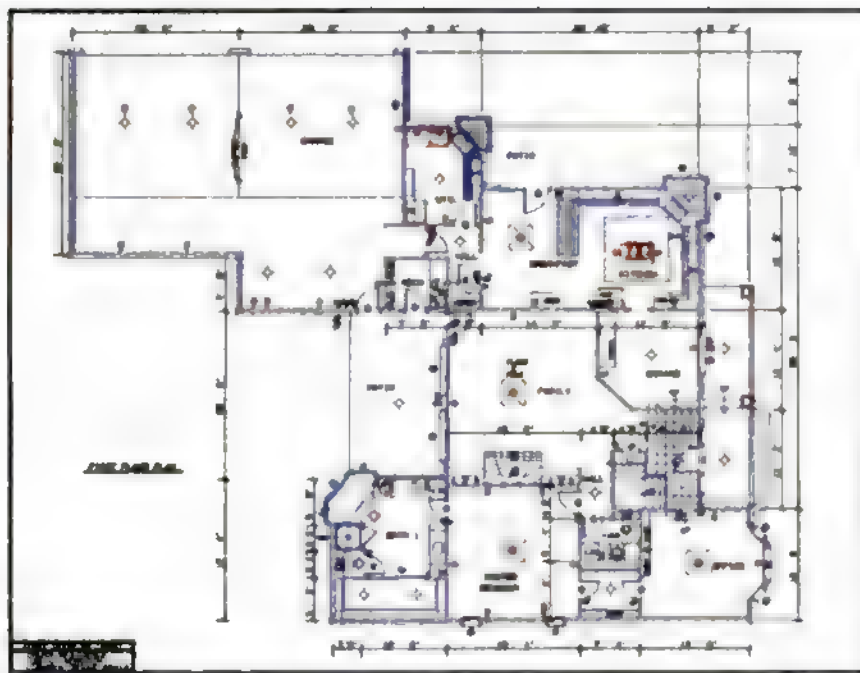
cially new users like me, need technical assistance and it's hard to get. The PC industry is evolving into new markets and it needs to respond to each market's needs."

Dennis Cox, director of marketing at Packard Bell, is making sure that the company makes the necessary adjustments. Cox and other Packard Bell executives recognized customers' frustration with the support line and determined to wipe out its bugs. "The hot-line dilemma was a situation that we were concerned with last year and this calendar year, and we immediately set out to improve it," he said. "We have increased the number of phone lines and more than doubled the number of service representatives." Also, Packard Bell plans to add 30 to 40 percent more technicians to its technical support staff. These should be in place by the time you read this article. "I think that if you passed your survey out now, you wouldn't hear our customers complaining anymore," Cox projected confidently.

DEPENDABLE SYSTEMS

Indeed, the survey respondents that we contacted had little complaint with Packard Bell machines themselves. In spite of his irritation at the hot line, Camiolo said that "the machine is fabulous." And Larry Shemesh, president of Industrial Dynamics Inc. of North Brunswick, New Jersey, praised his Packard Bell 80286 for its

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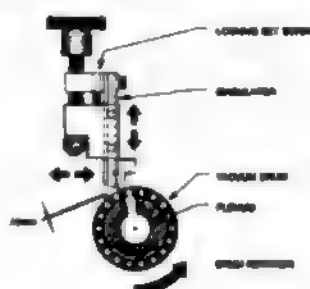
OPERATION INSTRUCTIONS

OPERATION INSTRUCTIONS

The operation of the plotter is explained in the following pages of the manual, and also in the form of a video cassette. The video cassette is available for \$19.95. The manual is available for \$9.95. The video cassette and the manual are available for \$29.95.

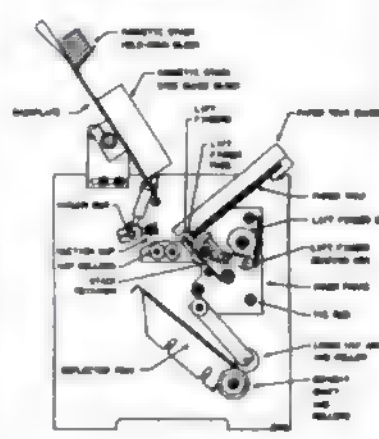
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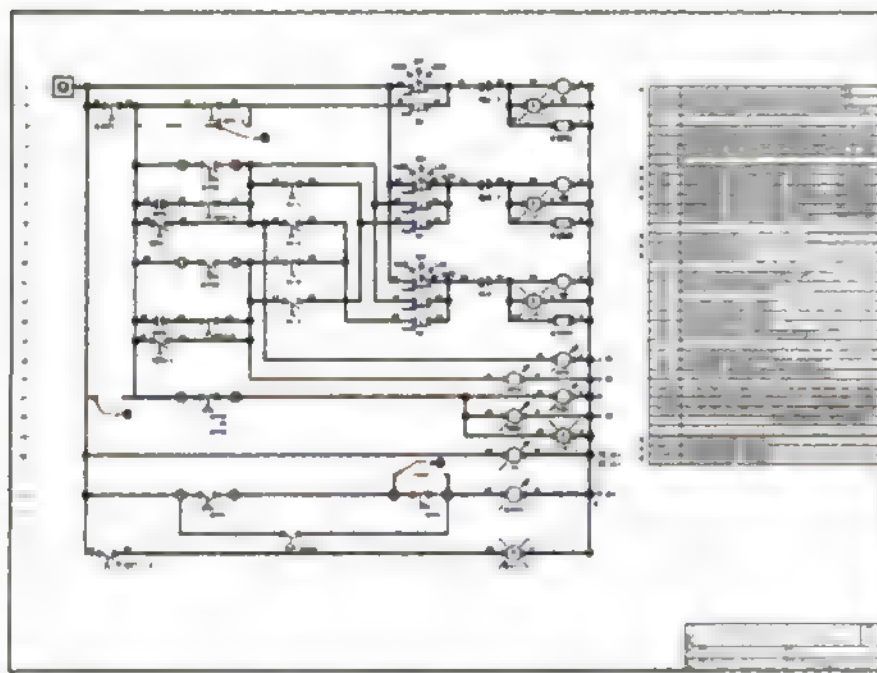


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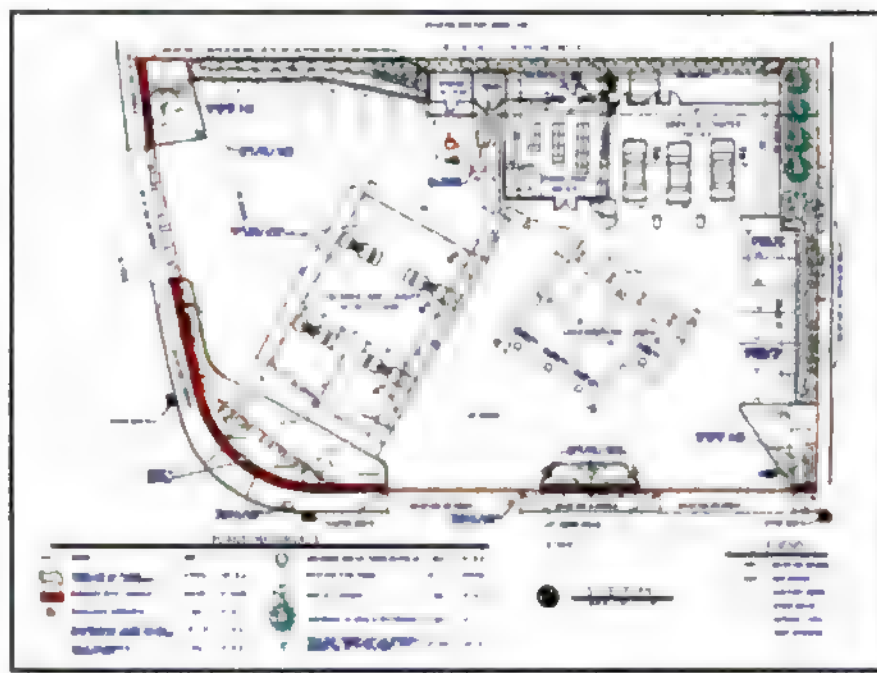
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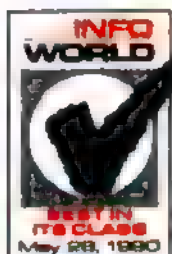
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CIRCLE 514 ON READER SERVICE CARD

DESKTOP PCs

"reasonable price and terrific performance."

Our survey results also confirmed that in terms of reliability and performance, Packard Bell had no central trouble point or outstanding flaw. This is not to say that there weren't problems, and in fact, when problems did come up, 34 percent of the Packard Bell respondents rated them "very serious"—a significant 11 percentage points above average. But overall Packard Bell came in even and steady, always scoring average or slightly better than average in problem areas such as power supply, memory deficiencies, defective motherboards, and so on. Like the old name it bears, Packard Bell machines don't appear terribly remarkable or fancy, but they certainly seem dependable and trustworthy.

CIRCLE 624 ON READER SERVICE CARD

PC Brand Inc.

by Susan G. Thomas

COMPANY SCORES



954 W. Washington St.
Chicago, IL 60607
(800) 722-7263
(800) 662-7378 (customer service)
(800) 541-8324 (technical support)

Actual score Average score High-low range

According to PC Brand's president Stephen Dukker, the company has grown over 400 percent this year alone. As one of the fastest growing mail-order vendors, PC Brand has made a splash in the market by offering reasonably priced IBM-compatible machines—everything from XT-compatibles to 386SX workstations and proprietary peripherals. In our survey, PC Brand scored about average for customer loyalty and technical support satisfaction. However, our survey results also point out that PC Brand has had trouble with reliability and customer satisfaction with repair service—significant trouble.

PC Brand scored a 65 on repair service satisfaction, well below the average score of 75. Even worse, with a reliability rating of 79, PC Brand came in lowest of the 27 PC vendors included in the survey.

But despite these low scores, almost

all the *PC Magazine* survey respondents interviewed for this article were unequivocally impressed with PC Brand's price-to-performance ratio, its five-year warranty,

and its technical support. Survey participant Laszlo S. Gonc, president of Gonc & Associates Ltd. of Chicago, Illinois, has owned his PC Brand machine for more than two years. He said he felt that PC Brand had offered him an "excellent price, especially for the value, and the warranty is great—I can't see where you can get a better deal."

Another respondent, Richard Zernow, an engineer at Applied Research Associates of Lakewood, Colorado, said that PC Brand "not only went out of its way to meet my personal specifications, but it also put a machine together before I bought it." For systems that sound so good, how could PC Brand rate so low on reliability and repair service satisfaction?

PC Brand's problems seem to be linked. Although PC Brand does provide toll-free "everything"—customer service, technical support, and even fax machines—some respondents had trouble with PC Brand's shipping policies, which had changed within the past year. Gary Pollock, who manages hospital information systems for a Washington-based firm, had to send back a disk drive on Air Express and found that PC Brand had changed its policy on overnight deliveries: the customer was now required to pay the shipping charge. When Pollock tried to contact his sales rep, he was told that the rep was no longer there. Pollock wrote several letters to PC Brand about the inconvenience he experienced with the new policy, but he got no response.

PROBLEM ON HOLD

Gerald A. Burnette, senior analyst at Environmental Consulting Engineers Inc. of Knoxville, Tennessee, had similar difficulties with PC Brand's shipping and customer service. He is trying to get

credit for a monitor he had sent back to the manufacturer. At this writing, the problem was still on hold.

Dukker contested reports of his company's shipping problems. "We have on-site service, so customers don't have to

Despite PC Brand's low scores for reliability and repair-service satisfaction, almost all the survey respondents were unequivocally impressed with its products' price-to-performance ratio, five-year warranty, and tech support.

come back to us," he said. "Repair is done by field service representatives who come to customers' sites." Dukker added, however, that PC Brand's customer service, technical support, and sales would soon "move in the direction of true account management, meaning that individual customers will deal only with one account representative so that they will have a steady, regular contact." This management transition, underway now, should be complete by the time you read this article. "But," in the words of survey respondent Burnette, "why has it taken so long?"

Ironically, capital growth had a lot to do with it. Dukker explains that because PC Brand has grown so rapidly—\$0-\$100 million in a year—"dropping a couple of balls" was inevitable. However, PC Brand is modifying its philosophy and its advertising to keep on the ball, with one ad promoting the idea that a vendor should not just manufacture good PCs but also satisfy customers. He explained, "The PC manufacturer isn't technically oriented anymore; technology is controlled by the chip manufacturer. Vendors now have a tremendous opportunity to be helpful to their customers in the way of service and technical support. And in the areas of distribution, service, and support, to say that PC Brand is committed is an understatement."

Dukker seems extremely confident of PC Brand's service quality. Backing him up, survey respondents did indeed recognize the adequacy of PC Brand's technical support, rating it a dead-average 66. Better customer and repair service will follow with the advent of the company's "true management" system. Dukker hopes so, too.

CIRCLE 625 ON READER SERVICE CARD

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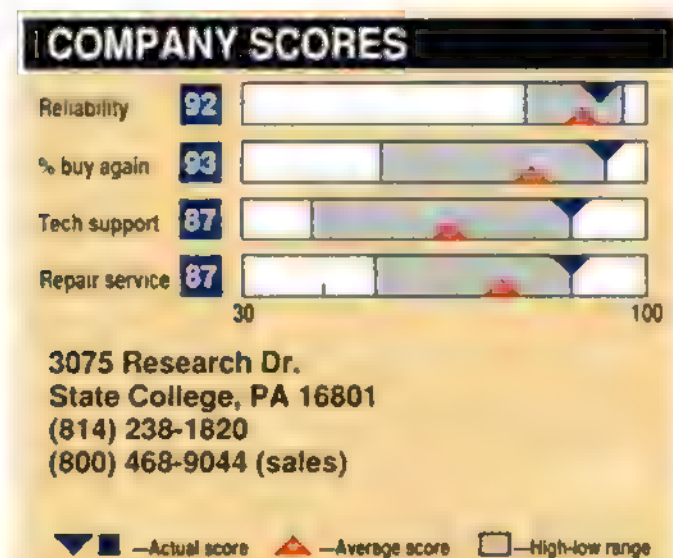
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Swan Technologies

by Gretchen Luchsinger



The folks at Swan Technologies must be doing something right. Swan, formerly called Tussey, took top honors above all PC manufacturers in the percentage of people who would buy its machines again (93 percent), and rated highly in satisfaction with tech support (87) and satisfaction with repair service (87). Survey respondents who own Swan PCs ranked the machines highly on overall reliability, giving it a score of 92, comparable to the average score of 89. Combined, these ratings mean that Swan managed to make and keep its users happier than any other PC manufacturer. Fellow mail-order specialists Dell and Northgate rated about equally well. The only caveat in Swan's performance on our survey is the relatively small base of respondents: 94, compared with the average 653 responses for other PC manufacturers.

Not bad for a medium-sized mail-order company that ships its own PCs, as well as brand-name peripherals and software programs, from the town of State College, Pennsylvania.

The motto at Swan seems to be if it is broke, *do* fix it. Fast. And with courtesy. "Our philosophy is that the customer is number one," says Swan CEO and president Jack Conrad, rendering for once some meaning out of that timeworn cliché. "We've put a lot of emphasis on a quality tech-support program to take care of our customers, because we believe that tech support absolutely influences buying decisions. Good support goes toward a lifetime relationship with each customer."

Conrad isn't just speaking out of one side of his mouth. His customers agree, and with more than just the numbers. Survey participant Eugene Sattler owns three Swan XT-10s and two Swan AT-12s, running computer-aided transcrip-

SERVICE AND RELIABILITY DESKTOP PCs

tion systems on them as a deputy chief reporter for the First Judicial District of the State Supreme Court in Manhattan. He rated Swan high on reliability, having experienced only one problem: the Miniscribe 3650 hard disk on one of the ATs mysteriously began to fail.

"I nursed the thing for a while before giving up and calling Swan," Sattler recalls. "It suggested I replace the Miniscribe with a Seagate ST-151, which it sent out with a very clearly written Swan-generated manual." Sattler followed the manual and set up the new hard disk himself, as he had gone beyond the one-year on-site service warranty. He has experienced no new problems since.

Would he go back for another computer from Swan? "Absolutely. I buy all of my software now from Swan because the sales force is so nice. It's a delightful company to work with, and it remedies problems within hours or days, some-

times at its own expense." support, which Swan offers free for the life of a machine. "Tech support is a must for clone machines," Furr says, "and in support, ordering, and follow-up, Swan has been impeccable."

Furr uses his machine at home, in part for his work as a project leader at the electric custom motor firm Industrial Drives in Blacksburg, Virginia. Initially, he experienced difficulty in reformatting his own old Miniscribe hard disk with the new machine's 16-bit RLL controller card. A quick call to Swan. "The reps were helpful and knowledgeable, even though I was asking pretty technically detailed questions." Furr's unit has been trouble-free ever since. "I sure would buy from the company again!" he says, adding that he expects his current system to meet his needs for the next four years.

The only flaw in Swan's tech support program indicated by respondents interviewed for this story comes from TRW, the company's third-party on-site service provider. Swan began its on-site service

"We've put a lot of emphasis on a quality tech-support program," claims Swan CEO Jack Conrad. Indeed, Swan took top honors not only for tech support and repair service satisfaction but also for brand loyalty.

times at its own expense."

Swan constructs its PCs from third-party parts, all of which, according to Conrad, undergo a rigorous three-phase quality-control program. And an average proportion of the survey respondents (41 percent) indicated experiencing a problem in the past year. When problems do occur on the end user's desk, they tend to be less severe: respondents gave the problems a severity rating of 36, lower than the average severity rating of 45. Survey results did not indicate that the problems are concentrated in any one particular area of the system.

IMPECCABLE SUPPORT

Participant Rick Furr bought a Swan 386SX nine months before he was interviewed for this story, when he decided it was time to retire his built-from-scratch XT. The software programmer and electrical engineer surveyed the clone marketplace. He was impressed by the Swan's price, its Phoenix BIOS, and its telephone

program last year; it covers 286, 386, and 486 machines, and can be extended for a fee for one or two years beyond the original year.

Swan's Conrad voices surprise. "It seems to me that on-site would be preferred," he remarks. "We are doing much more business now in business, government, and education, where guaranteeing that there will be no downtime is important."

Customers' complaints, however, were not directed toward whether they had on-site service—they focused more on the quality of that service. Daniel Morgan solved his problems by cutting TRW out of the loop.

"We weren't very impressed with TRW," says the manager for information services at Wittenborn Art Books in Manhattan. "TRW seemed to be only slightly more knowledgeable than I was, and I, at the time, was a neophyte."

Morgan had purchased a Swan 386/20 in order to run word processing, a data-

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COPY ORIGINAL DIRECTORY STRUCTURE	✓	✓	✓	✓
DATE/TIME STAMP FILES	✓	✓	✓	✓
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DESKTOP PCs

base, desktop publishing, and an accounting system for the retail fine arts bookstore and mail-order concern. When the hard disk failed, Morgan called Swan. A TRW repair person replaced the disk, controller card, and cables. After a couple more hours of use, the machine went down again.

Swan responded by sending out a new disk and card—and another TRW service representative. This time, Morgan experienced problems when trying to load certain applications. "By this time, my credibility was on the line," he says. "We had just spent several thousand dollars on this machine, which I had persuaded the store to buy."

Morgan got on the phone with Swan and requested a new computer. It Federal Expressed the replacement unit (under warranty, products are shipped overnight for free) and today Morgan's trouble-free 386/20 is one of the sights he proudly points out to people who pass through his office. "I wave the Swan flag," he comments. "These people are great when it comes to making things work for the customer."

Swan PCs are not known for being the hottest performers on the PC market. Nor do they approach infallibility. But it is a sign of the company's remarkable support system that when asked if he would purchase another Swan machine, a customer with Morgan's experiences responds with an enthusiastic yes.

CIRCLE 626 ON READER SERVICE CARD

Tandy Corp.

by John R. Quain

COMPANY SCORES



1800 One Tandy Center
Fort Worth, TX 76102
(817) 390-3011

—Actual score —Average score —High-low range

One of the first companies to introduce personal computers to consumers back in 1977, Tandy claims to have been in the personal computer business longer than anyone else. With a retail support chain of more than 7,000 Radio Shack stores and Computer Centers, the multibillion-dollar

Fort Worth-based company has never been known for sex appeal or Euro styling, but this Ford of PCs has enjoyed a reputation of being just around the corner when you need it.

The large customer base Tandy holds is reflected in the number of survey responses we received: 714. On the average, Tandy respondents had used their machines for more than two years—about six months longer than the average PC in our survey. The Tandy machines seem to have held up; respondents gave them a score of 92 on reliability, comparable to the average 89.

THE MEANING OF PROPRIETARY

When it comes to bringing customers back into the fold, however, Tandy appears to have more trouble than most PC vendors: only 70 percent said they would buy from Tandy again—significantly lower than the average 80 percent for this survey question. Many respondents cited various proprietary aspects of Tandy's systems as their primary reason for not returning.

"If Tandy doesn't have it," said John Hollowell, echoing the sentiments of more than a few respondents, "you can't put it in there." Hollowell, a former computer technician for the Navy, now living in Folly, South Carolina, cited the difficulty of upgrading the color graphics of his 1000 SX, and that it requires 10-inch boards rather than the industry standard of 13 inches.

Ed Juge, director of market planning for Radio Shack, feels the complaint about proprietary design is misdirected. "It's just not a fair complaint," he says, noting that the smaller footprint requires smaller expansion slots. "We make that clear from day one. It's like buying a car and complaining that it won't fly," he quipped. He also emphasized that other manufacturers do use the same size and claims that "there is nothing you can get on a 13-inch board that you can't get on a 10-inch board."

Tandy's service, tech support, and marketing strategies are unique in the industry. Tandy machines are sold directly to customers from its network of Radio Shack and Tandy Computer Center stores. With a standard one-year parts-and-labor warranty, customers simply bring their equipment into the store, where it will be repaired on-site or sent to a Tandy service center. Most of the Tandy

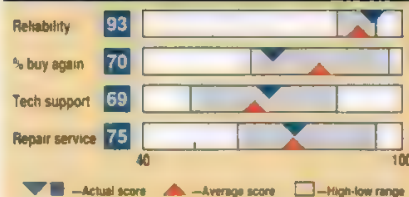
users responding to our questionnaire found the arrangement satisfactory. They gave it a score of 72, comparable to the average score of 75. Tech support scored a 61, a tad below the average of 66.

THE RIGHT PERSON

Experiences among respondents interviewed for this story ran the gamut. When he first walked into a Radio Shack store, Curtis Ward, owner of Action Network Consulting in Plano, Texas, found that salespeople were "not knowledgeable at

Tandy Corp.

80286 models



—Actual score —Average score —High-low range

all." Later, when he tried to upgrade the BIOS in his Tandy 3000, "it took the staff four tries" before he received the proper upgrade. Now, as the owner of a network consulting firm, "I know quite a bit more, and I still have trouble" finding qualified Tandy or Radio Shack personnel. He's had experience with eight to ten Radio Shack stores, including Computer Centers. Eventually, he did find knowledgeable Tandy personnel. "If you can find that person, you're home free." Ward currently owns a Tandy 3000 HL that he "has brought up as a Novell server and used all ten slots." He reports that he "really hasn't had many problems with the computer."

While Radio Shack's Juge concurs that sales staff aren't always the best equipped to provide technical assistance, he says that the "right person" does exist—at Tandy's Computer Centers. "In the Computer Centers there is a person known as the systems engineer, and his sole role is customer service," he says. If the systems engineer can't answer a question or solve a problem, according to Juge, there's telephone support for the engineer.

According to the comments in our questionnaire, not all consumers are delighted with this particular tech-support system. "I bought my machine from Tandy," explained Hollowell, "because I thought I could get it repaired anywhere, but it turned out that only one place [in the area] could repair it."

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PROCESSOR TYPE/SPEED	80386SX, ¹ 16 MHz	80386SX, 16 MHz	80386, 25 MHz	80386, 25 MHz	80386, 33 MHz	80386, 33 MHz	i486, 25 MHz	i486, 25 MHz	i486, 33 MHz	i486, 33 MHz
HARD DISK STORAGE	40 MB	40 MB	110 MB	110 MB	320 MB	320 MB	320 MB	320 MB	320 MB	320 MB
LANDMARK RATING	23 ¹	15 ¹	30 ¹	41 ¹	53 ²	N/A	114 ²	111 ²	140 ²	N/A
UPGRADE- ABILITY	YES	NO	YES	NO	YES	YES	YES	NO	YES	YES
DIRECT SUPPORT	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
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CIRCLE 166 ON READER SERVICE CARD

DESKTOP PCs

Other Tandy respondents were very pleased with the level of support, reflecting the varied nature of dealing with a nationwide chain. Richard Green, a salesman in Elizabeth City, North Carolina, uses his Tandy 1000 SL for mailing lists, word processing, and tracking customers. When he bought his computer, the Tandy salesman spent five evenings working with Green until he was comfortable with the machine. When Green had trouble with the computer's hard disk, the store sent it to the repair center, and "it came back in about three weeks. The second time, the salesperson took it right off the shelf." The Radio Shack near him is open seven days a week, so "there's not a whole lot of times I can't get the system going."

Though it no longer does so, according to Juge, at one time Tandy did support a toll-free hot line, but the company found that the line became tied up by customers requesting noncritical information, such as how to get to the next level in a Dungeons and Dragons game. Customers with serious questions had difficulty getting through. Since it dropped the 800 number in favor of a regular 817 phone number in Fort Worth, according to Juge, even on the busiest lines, eight out of ten callers get through the first time.

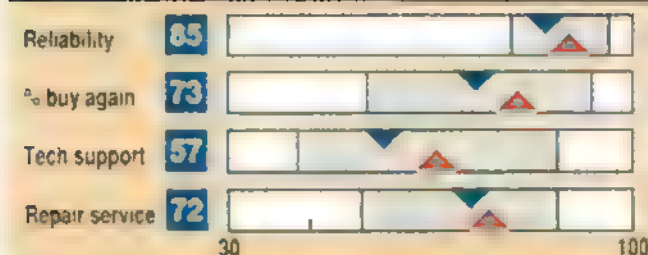
With a retail chain the size of Tandy's, it's not surprising that there was a diversity of experience among respondents. The more important question our survey raises is whether customers who started out at the Radio Shack around the corner will decide to stay in the neighborhood or shop elsewhere when it's time to get a new computer.

CIRCLE 627 ON READER SERVICE CARD

Wyse Technology Inc.

by Susan G. Thomas

COMPANY SCORES



3471 N. First St.
San Jose, CA 95134-1803
800-438-9973
201-750-0700 (sales)
800-327-5231 (technical support)

Actual score Average score High-low range

Despite a reputation for its attractive price/performance and compatibility, clone maker Wyse Technology scored below average in several areas of customer concern on our survey: number of reported problems, satisfaction with technical support, and customer loyalty.

Among our survey respondents, 52 percent indicated having experienced a problem with their Wyse machines in the last 12 months—significantly higher than the 41 percent overall. The severity rating participants gave these problems was about average (41, compared with the average 45), and respondents' satisfaction with the repair service they received

information. When end users called Wyse for technical support, they were almost always directed to their local dealers. Good technical support was basically the luck of the draw. If dealers were knowledgeable, helpful, and dutiful about calling up their distributors for up-to-date technical news, end users could get good service; if not, tough luck.

Survey respondent Tom Mihalic, systems officer at Pikes Peak Library District in Colorado Springs, said that he tried to call Wyse directly several times because his clock chip was bad. "I spent 30 minutes on a toll call trying to get through to someone in technical support and when I finally did, they told me to go to my dealer." When Mihalic explained that he

"I spent 30 minutes on a toll call trying to get through to someone in technical support at Wyse, and when I finally did, they told me to go to my dealer," complains one survey participant.

was also about average (72, compared with 75). But participants were dissatisfied with the technical support they received; they gave it a score of 57, well below the average 66. Ultimately, their dissatisfaction may have led to the below-average percentage of respondents who would buy from Wyse again; only 73 percent said they would go back to the same vendor, compared with the overall 80 percent.

What's wrong with the company's tech support? The problem seems to lie in Wyse's two-year-old decision to model its support program after its two-tiered distribution system. The two-tiered system is organized so that Wyse can avoid hassles with huge numbers of dealers; it doesn't sell its products directly to dealers (except BusinessLand) but instead sells them to distributors, who then sell them to VARs and dealers.

ONE STEP TOO MANY

The support system worked in much the same way—two steps away from the end user. Dealers had to go to their distributors—not to Wyse itself—for information. Wyse even limited toll-free technical support to distributors; dealers and VARs had to call Wyse distributors to get the manufacturer's latest technical

wasn't the original buyer of the machine and thus didn't know the dealer, the Wyse rep couldn't tell him where to go or whom to see. "If Wyse wants users to get their technical support from their dealers, then the company should at least know who its dealers are," he says. Wyse should take a cue from Compaq and IBM, both of which offer toll-free dealer locator numbers.

David Coup, another participant and a corporate officer at Coup & Smith Architects of Calexico, California, had similar problems getting technical support from Wyse. His 80386 had difficulty transferring files from his 80286. Characters would fragment, or the machine would list a single character on a page—sometimes making a one-page document more than four hundred pages. Coup contacted his dealer. Failing to get good service there, he called the distributor. "The distributor couldn't even get an answer from Wyse," he says. "And it took eight months to get a BIOS upgrade."

As far as Wyse systems themselves go, respondents seem satisfied: on overall reliability, they gave Wyse a score of 85, comparable to the 89 average. Survey participant Chris Wetzler, controller at Syron Engineering, said that he'd experienced "no problems," aside from a minor adjustment that had to be made to his



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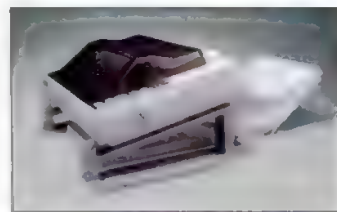
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CIRCLE 220 ON READER SERVICE CARD

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DESKTOP PCs

motherboard. And Coup, in spite of his problems reaching Wyse technicians, said that "the physical machine itself has been outstandingly trouble-free. It's just that when bugs pop up, as they will with any computer, it's hard to get support from Wyse."

WHEN BIGGER MEANS BETTER

The news is better for large accounts, who deal one step closer to the manufacturer. Survey respondent Janice Barret, micro

financial end of their purchases than they do of the technical. They look in the business section of the paper, see that Wyse is in trouble, and they don't want to invest in a company that might be too risky. I tell them that we'd always be able to find compatible products—that's the virtue of buying from Wyse—but it's still a concern for them."

But according to Wyse's Offutt, the

**The bad news and the good news are the same:
Zenith's marks were average overall.
"Reliable" is how many respondents
characterized their Zenith desktops.**

systems administrator at San Francisco-based Bechtel Investments Inc., buys directly from a Wyse distributor who "sold her on Wyse products." Barret has always had terrific experiences with Wyse: "On the whole, Wyse has great service, great equipment, and its design isn't hard to learn." But she was quick to point out, "I think I get better material than the end user because I work directly with the distributor." What about the end user?

Tom Offutt, service and support manager at Wyse, said that Wyse is revamping its tech support system so that end users will be able to contact the manufacturer directly. Offutt explained: "We were trying to develop a two-step support system that would mirror our distribution plan. We had a toll-free hot line for our distributors and began to train people at the retail level with technical information right from the manufacturer. But the plan wasn't effective. Dealers and the manufacturer weren't making enough margin, and the users preferred manufacturer support. So we're going back to the one-step plan." The new program should be in place by next year and will include a toll-free hot line for dealers and VARs. But end users will still have to make a toll call if they want to talk to a Wyse technician.

In follow-up interviews, some survey participants expressed concern about Wyse's financial future. As a buyer for an investment firm, Barret said that she was having trouble "selling" Wyse to her employer. "I think Wyse has good equipment," she said, "but I work with financial analysts and they think more of the

company "is not in trouble." In January of this year, Wyse was acquired by Channel International, a Taiwanese consortium of investors. The only major change for Wyse, says Offutt, was going from public to private. "I can see how some of our customers might have been confused," he explains, "but the offer really wasn't hostile at all. It was done in conjunction with the board of directors, and everyone was happy with the price." He added that he thinks the change of management "will probably be beneficial in the long run. Now we can look to the future instead of just to the quarter."

Wyse is changing. With funds from Channel and a greater awareness of how to support the end user, perhaps Wyse can improve customer loyalty.

CIRCLE 628 ON READER SERVICE CARD

Zenith Data Systems

by John R. Quain

COMPANY SCORES



1571 Feehanville Dr.
Mt. Prospect, IL 60056
(708) 699-4800
(customer service and technical support)
(800) 553-0331

Actual score Average score High-low range

Zenith Data Systems

80386 models



80286 models



8088 models



Actual score Average score High-low range

Despite its name, Zenith didn't top the ratings among desktop machines in our survey. The bad news and the good news are the same: Zenith's marks were average overall.

In most users' minds, Zenith is the company to go to for laptop machines and flat-tension mask monitors. The company's ZCM-1490 monitor won a *PC Magazine* Award for Technical Excellence in 1987, and in the previous year Zenith captured an award for its Z-181 portable.

Most recently, Zenith generated news when, in December of last year, it sold its data systems division to Groupe Bull, in the process of which a minor dispute—concerning a few million dollars—generated headlines. The sale price was finally resolved last April, and Zenith Data Systems is now the PC subsidiary of Groupe Bull. According to Zenith's media relations manager Glen Nelson, there have been "no major changes as a result of the acquisition." Based on our survey results, in Zenith's case, no news is good news.

In our survey, Zenith distinguished itself by being average—or, as an anxious mother might describe a suitor to her 40-year-old unmarried daughter, "good average." Among the 506 survey replies from Zenith owners, "reliable" is how many respondents characterized their Zenith desktops, bringing in an overall reliability rating of 88 for the company

DESKTOP PCs

(compared with the average of 89).

When users did encounter system flaws (and 44 percent did), the problems turned out to be no more severe than those found with other companies' machines, but yielding a severity rating of 45. The company's basic one-year parts-and-labor warranty also didn't turn off surveyed customers, who rated Zenith's service exactly average at 75. Satisfaction with technical support was also fine at 64, comparable to the 66 average.

BACK FOR MORE

The real question turned out to be: Would users go on a second date with Zenith? Across the company's various product lines, the buy-again numbers held firm, with the only noteworthy difference showing up with 8088 owners, who seemed more inclined than most to return to Zenith for their PC needs. The percentage of respondents who said they would purchase again from Zenith was 76 (comparable to the average 80).

Of the 24 percent who said they probably wouldn't accept a second invitation, Joe Cross, a group engineer at Beech Aircraft in Wichita, Kansas, was typical. "My biggest problem with Zenith," Cross confessed, "is that its solutions are pretty expensive." When he had trouble with his Z-100, he discovered that "the replacement board I needed cost more than the whole computer." Cross found the authorized dealer to be "very helpful in terms of getting manuals and schematics," but pronounced Zenith's support to be "erratic."

Cross currently uses a Z-286, with which he has yet to encounter any major difficulties.

"Basically, the quality of the machines," he feels, "is quite a bit better than the [mail-order] clones." But aside from the Zenith monitor, Cross says he probably won't buy again from Zenith, because of more-competitive prices offered by other manufacturers.

Zenith's Nelson stresses that the company offers prices below that of IBM and Compaq—but above those of the clone houses. He emphasizes that Zenith customers are "paying for a full-quality product." Currently, Zenith is further strengthening ties with its dealers.

"In January, we pared the number of authorized dealers down from over 1,500 to just over 400," Nelson points out. "Our goal by year's end will be 560," he notes, adding that the idea behind the move is to

increase the level of service from authorized dealers, who are responsible for performing service and repair work. If customers want more-specific support programs, Zenith offers a welter of purchase agreements to suit most needs, including an 800 number, bulletin board access, and service within 48 hours.

So if Zenith failed to rise to the apex of our polls, it also never fell to the nadir. In our survey, there was a general impression among respondents that the company was maintaining a smooth, constant orbit with its machines.

CIRCLE 629 ON READER SERVICE CARD

Zeos International

by Gretchen Luchsinger

COMPANY SCORES



530 5th Ave. NW, #1000
 St. Paul, MN 55112
 (800) 423-5891 (sales)
 (800) 228-5390 (technical support)

In the May 1990 edition of *Inc.* magazine, Zeos International ranked nineteenth in a list of the fastest-growing small public companies in the United States. Here is solid proof that the St. Paul, Minnesota-based manufacturer of mail-order PCs is an aggressive contender in the ever-competitive clone market, which it entered first in 1987.

For some *PC Magazine* survey respondents, that growth has proved to be a little too fast. Participants did rate Zeos above average in satisfaction with tech support (75, compared with the average score of 66) and satisfaction with repair service (85, compared with the average of 75). And respondents rated it average in overall reliability (89). But those interviewed for this article complained frequently about the buzzing busy signal on the end of the company's 24-hour tech-support line—a concept the company claims to have invented. "Best to call in the wee hours," said one respondent. Others complained of a response time that took more than a full day after the initial call.

OFF THE HOOK

Part of the problem, according to Zeos chairman of the board and CEO Greg Herrick, may have been that our survey was distributed while Zeos was enjoying a heady period immediately following a *PC Magazine* Editor's Choice for its Zeos 386SX-16. The review praised the Zeos machine for high performance and low price. At mail-order headquarters, the phones rang off the hook.

"When the review came out, we had just lowered the price on the 386SX, and we were shipping three to four times the number of systems we had sent out in the past," Herrick says. Since then, Zeos has reportedly doubled its number of telephone technicians and assigned different numbers to its tech and sales departments, respectively. "Then it took hours; now it takes minutes," Herrick claims, adding, "I don't think you should have to wait more than five minutes to speak to a human being."

Survey respondent Louise Miles was one of those who got caught in the shuffle. The sole proprietor of an architecture firm in Washington, D.C., any major downtime on her single-office PC means a significant impact on her business. She purchased a Zeos 386SX after seeing the *PC Magazine* Editor's Choice selection and considering the kind of support Zeos advertised—which combines the 24-hour tech line with a 30-day money-back guarantee, a year's warranty on parts and labor, and an optional on-site service contract. Miles thought Zeos was a safe bet, and was willing to pay the extra \$49 for a year's worth of on-site service. When her power supply went down, she was understanding. When she called Zeos—which in her experience had an 8- to 12-hour response time—the technician requested she send the machine back. Miles grew impatient.

"Zeos told me it couldn't arrange on-site service and sent me the power supply, saying I would have to install it myself. It took me an hour to do it," Miles says.

After the power supply problem was solved, she began experiencing boot-up difficulties with the hard disk. Phone calls flew back and forth between Miles and Zeos. Miles says Zeos denied the problem; she demanded it be solved. Finally, a new hard disk controller arrived. This time, a repair person from TRW, Zeos' on-site third-party repair service, installed it. Today, Miles still encounters boot-up problems with the new hard disk. But she

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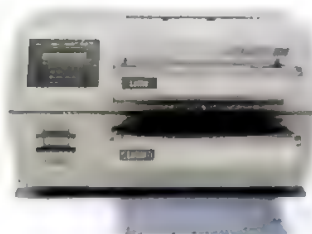
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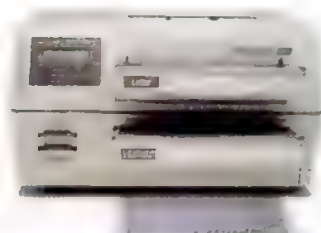
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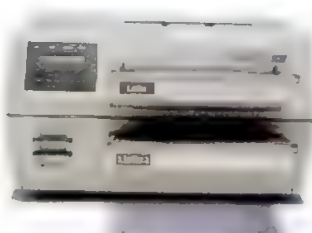
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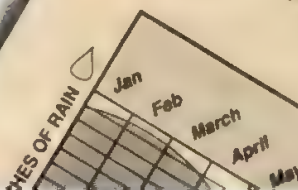
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SERVICE AND RELIABILITY

DESKTOP PCs

cannot spare the computer to any more downtime. And despite the Zeos machine's performance pluses, Miles doesn't plan to buy another Zeos machine as her young business grows.

As with other mail-order houses—such as CompuAdd, Dell, and Northgate—the percentage of survey respondents who reported a problem with their Zeos PCs was higher than average: 50 percent for Zeos, compared with 41 percent overall. The severity rating of the problems was 42, comparable to the average severity rating of 45. The Zeos 286, which had a significantly higher problem incidence (54 percent, compared with the overall 42 percent for 286-based systems), suffered from calendar and clock failures, noise from squeaking fans, lock-ups, disks crashing, dead graphics boards, and power

inoperable more than a year and a half ago. "I did wonder how it left the factory in that condition, though," he recalls. Lord wanted the machine for his own personal use, to run word processing and shareware, as well as some CAD programs for his job as a lab technician for Osteo Technology, a manufacturer of medical diagnostic products in Framingham, Massachusetts. But he wasn't under time pressure, and he didn't mind when Zeos asked him to ship the defective machine back, the charges on them.

The turnover was eight days, as Lord remembers it. Still, he was won over by the company's willingness to help out. "Their response was very warm and accommodating," he says. Lord says that he would definitely consider another Zeos in the future.

George Benton likes his Zeos 386 so much he has purchased six of them as president of Southport Inc., a steel fabrication company in Harvey, Louisiana. "Zeos is in a class by itself for its support and for its product," he enthuses. "It has the best quality of customer support we have experienced in six years of PC involvement."

Benton, who runs the full gamut on his machines, from word processing to CAD to spreadsheets, hasn't experienced any difficulties with his Zeos PCs other than a few software glitches. He has found the tech support line helpful: "The main thing is the reps always know what they're talking about." He plans to purchase more Zeos machines in the future.

Zeos is still young and learning. Herrick recalls that in the first four to six months of manufacturing the 386SX in early 1989, Zeos received a number of complaints. These resulted from the use of motherboards from two different third-party companies, he says. Within the last year, the design and manufacture of Zeos 386SX motherboards have been brought in-house. "We have dramatically improved the quality and have noticed a drop in complaints," Herrick says. According to him, Zeos, which has traditionally assembled machines from both in-house and third-party components, will move increasingly in the direction of making all of its own parts as a means of quality control. Herrick concludes, "As time progresses, we learn about what areas have problems, and make improvements, with the ultimate goal of eliminating them."

Zeos International

80386 models



Zeos 386SX-16



80286 models



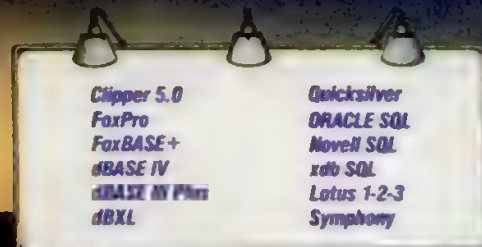
■ Actual score ▲ Average score □ High-low range

supply failures, according to survey participants. With the 386SX, respondents noted bad parallel and serial ports, defective controller cards, and improper delivery and configuration.

Zeos's Herrick points out that as the 286 machines approach obsolescence, Zeos has cut back production to almost zero, although he hastens to add that they are still fully supported by the company's tech department.

Survey participant Stephen Lord wasn't too perturbed when his Zeos 286 arrived

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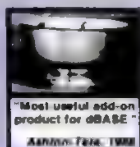
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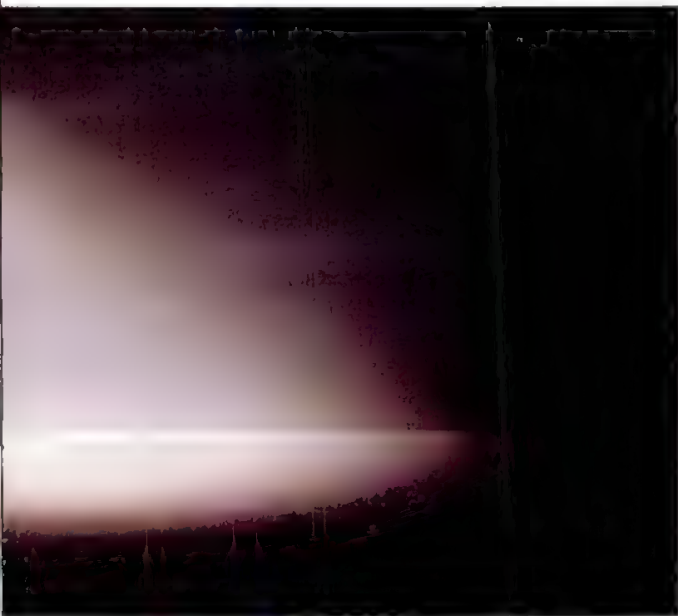


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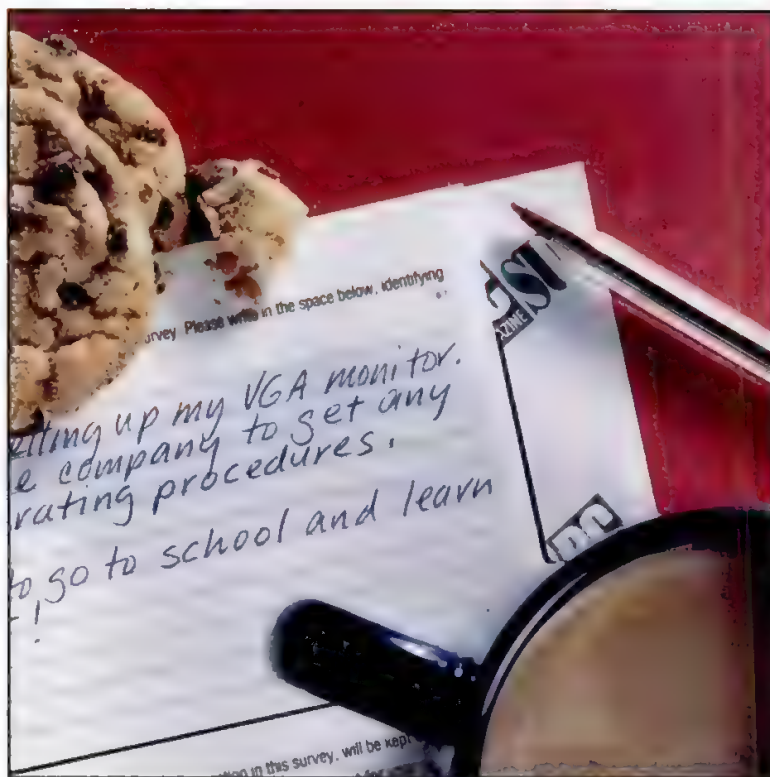
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Staring into your computer screen for such a large part of your workday, you get to know your display monitor almost pixel by pixel. When a problem starts to develop with a monitor, you can see it happening right before your eyes. And when you have to send out the monitor for service, you want to get it back in front of you as quickly as possible.

PC Magazine's Service and Reliability Survey asked readers to rate the reliability of their monitors and the service and tech support they received when they had problems



MONITORS

IN THE EYE OF THE BEHOLDER

or questions. Tallying the results, we find that 22 manufacturers currently producing monitors have attracted at least 75 responses each (see "Numbers You Can Trust: How Much Is Enough?"), and we publish the results from their users here. These companies include AST, AT&T, Compaq, Gold-Star, Hewlett-Packard, Hyundai, IBM, Magnavox, Mitsubishi, Nanao, NEC, Packard

M

BY
MICHAEL
COHN

onitor users responding to our survey provide us with reams of information about the comparative reliability of types of monitors and the service you can expect from their manufacturers.



MONITORS

Bell, Princeton Graphic Systems, Relisys, Samsung, Seiko, Sony, Tandy, Tatung, Taxan, Wyse, and Zenith.

One other company, Thomson, also garners enough responses, but since it no longer produces monitors, information about its products and policies doesn't seem relevant enough to merit much space. According to a Thomson spokesman, the company will continue to support customers for the duration of their warranties. In case you use a Thomson monitor yourself and are curious about how it fares in our survey, we'll just mention that it earns a 94 as its reliability rating, a 15 percent overall problem incidence, a score of 83 for satisfaction with technical sup-

port, and 82 for satisfaction with repair service. 77 percent of the Thomson monitor users responding to our survey say they would buy from Thomson again. If they could.

RESOLUTION BREAKING

We classify the monitors that readers have identified according to the types of video adapters they work with. (See the Graphics Adapters section for ratings of video boards.) That allows us to look at product lines within companies as well as to compare individual models against larger groups. The categories we used include

monochrome, CGA, EGA, VGA, Super VGA, and 1,024 by 768 resolution (also known as 8514/A).

Of course, many monitors on the market today scan at rates compatible with several types of adapters. We generally class those monitors according to the highest type of adapter they can work with. We assume that most users are running these monitors with cards that provide them with the best resolution possible.

For this introduction, however, we have decided to break out a seventh type of monitor from among the others. We wanted to look more closely at multiscanning displays. A popular subset of the type

HEAD TO HEAD: COMPANIES COMPETE ON SERVICE AND RELIABILITY

According to the readers who responded to our survey, Nanao USA Corp. and NEC Technologies sell the most reliable monitors. Zenith Data Systems comes in last in this category.

Nanao heads the pack again with the largest percentage of customers who would buy from the same manufacturer in the future. AT&T Data Systems has the lowest score for repeat business.

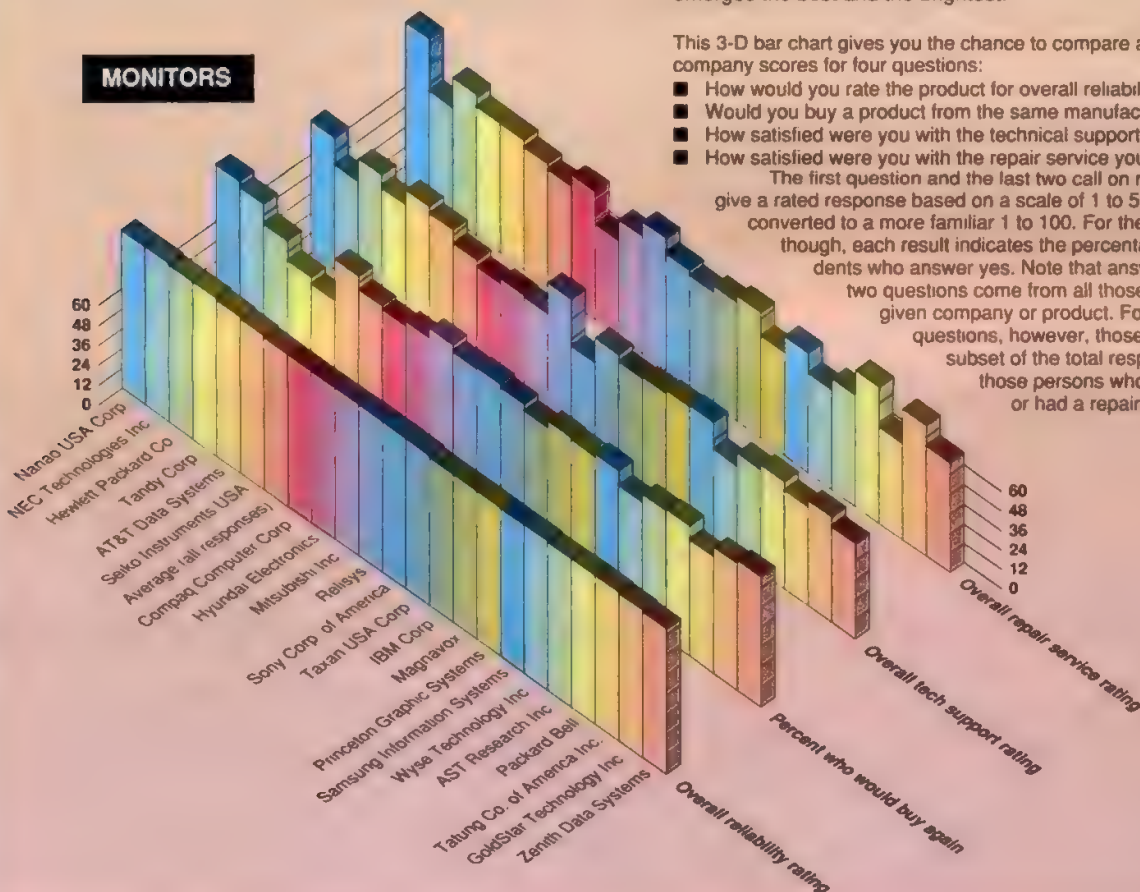
The overall tech support rating doesn't reach over 84 for any company. Relisys evidently provides the best support, Wyse Technology the worst. The average score for tech support is a dismal 67. Admittedly, most of the other hardware categories have similarly low tech support ratings. Repair service looks a little better, with an average of 71. Hyundai Electronics and Tatung Co. of America flunk this category together. Nanao, with a solid 100, emerges the best and the brightest.

MONITORS

This 3-D bar chart gives you the chance to compare at a glance the company scores for four questions:

- How would you rate the product for overall reliability?
- Would you buy a product from the same manufacturer again?
- How satisfied were you with the technical support you received?
- How satisfied were you with the repair service you received?

The first question and the last two call on respondents to give a rated response based on a scale of 1 to 5, which we converted to a more familiar 1 to 100. For the second question, though, each result indicates the percentage of respondents who answer yes. Note that answers to the first two questions come from all those responding for a given company or product. For the last two questions, however, those answering are a subset of the total respondents—only those persons who tried tech support or had a repair problem.



of monitor that works at different frequencies, multiscanning monitors can automatically adjust to a wide range of sync rates, as opposed to fixed-frequency and multiple fixed-frequency units. Since most multiscanning monitors work at least as high as the VGA range, it probably makes sense to compare them with VGAs.

MULTISCANNING VS. VGA

The average reliability score for multiscanning monitors is 95, compared with 89 for VGA monitors and 92 for monitors overall. The problem incidence is low at 11 percent, compared with the 19 percent problem incidence of VGAs. For monitors overall, the problem incidence falls between those two results, at 14 percent.

Satisfaction with the technical support for multiscanning monitors averages 65, comparing closely with a VGA average of 66 and an overall average of 67. Satisfaction with the quality of repair service averages 67 for multiscanning, 71 for VGA, and 71 for overall monitors.

In general, then, multiscanning monitors demonstrate somewhat higher reliability and fewer problems than VGA monitors. They might be a little harder to service satisfactorily, however. Note that 85 percent of the multiscanning monitor users personally selected their specific manufacturer and model, as opposed to 77 percent for VGA monitors. Multiscan-

SUPER VGA VS. 1,024 BY 768

The survey results also permit a comparison of the reliability of Super VGA monitors (those that can scan up to 800 by 600 resolution) versus 1,024 by 768 displays.

Average reliability seems to be about the same: 95 for Super VGA and 94 for 1,024 by 768. The overall problem incidence also comes out equal: 12 percent for both. A higher-than-average proportion of 1,024 by 768 users have chosen the specific brand and model they use: 87 percent, compared with 82 percent for Super VGA. Both figures are higher than the average of 77 percent for monitors overall. Tech support and repair service satisfaction put Super VGA slightly in the lead. Impairments within the past year have been somewhat less common with 1,024 by 768 monitors, however.

MONITOR TYPES COMPARED

The average reliability ratings for all the different types of monitors stack up roughly the same. Super VGA and CGA (along with the multiscanning monitors derived from all the other types) run slightly ahead, with scores of 95. Scoring lowest in reliability, at 89, are EGA and VGA monitors.

VGA has the highest overall percentage of problems (19 percent), while CGA

for the 22 monitor companies on the question of overall reliability and the percentage of respondents who would purchase from the same manufacturer again. It also indicates satisfaction ratings for the technical support and the repair service provided by all sources for each company's monitors. This chart is a handy overview of how the different display manufacturers stack up against one another.

In case you're wondering how these companies compare on the other survey questions, here's the scoop on the highest and lowest ratings for some of them. For the percentage of problems, Nanao has the lowest incidence (5 percent), while Zenith has the highest (23 percent); the problems with Zenith monitors range from flickering or fuzzy images to monitors dead on arrival. As for the average severity of the typical problem, Seiko and Tandy tie with the lowest severity rating, 38, while Tatung has the highest severity, 80. 4 percent of the Tatung respondents report instances where their monitors just would not work.

When asked how many times during the year a monitor has been *unusable*, respondents cite GoldStar for the highest number, with an average of 9 unusable occasions in the previous year—8 points higher than the overall average. As for the number of times a monitor has been merely *impaired*, AST's monitors have the greatest number, with an average of 13 impairments during the year. (Magnavox EGA monitors have been impaired even more often during the year, an average of 26 times, although the average result for *all* Magnavox monitors is only 6 malfunctions. The average for all monitor companies is 4.)

Satisfaction with tech support provided by the manufacturer itself is lowest for Wyse, with a rating of 48, and highest for Relisys, with a rating of 100. The average rating is 66. Satisfaction with repair service provided directly by the manufacturer is lowest for Hyundai, with a score of 33, and highest for Nanao, with 100. The average rating is 62.

Sony has the highest proportion of respondents responsible for selecting the specific manufacturer and model of their monitors (87 percent), while Hewlett-Packard has the lowest (60 percent). Note, however, that even among Hewlett-Packard users the majority of our survey respondents are brand specifiers. The average, by the way, is 77 percent.

In general, multiscanning monitors demonstrate somewhat higher reliability and fewer problems than VGA monitors. They might be a little harder to service satisfactorily, however.

ning monitors may be just a bit more heavily in demand by individual users, but it's hard to be sure, since the VGA type includes multiscanning units as well as fixed-frequency types.

As for individual problems, neither type seems to suffer from particular defects to any great extent. But the number of multiscanning respondents who classify their problems as "very serious" amount to 26 percent, while 36 percent of the VGA respondents say the same. For monitors overall, the proportion of respondents who categorize their problems as very serious figures at 32 percent.

has the smallest (10 percent). The average severity rating of a typical problem comes out as high as 63 for VGA, and as low as 52 for Super VGA and monochrome (51 for multiscanning). 89 percent of the multiscanning and 88 percent of the 1,024 by 768 monitor users would buy from the same manufacturer again. Compare this with the lowball score of 73 percent for the eyestrain-inducing CGA type.

MONITOR COMPANIES COMPARED

The three-dimensional bar chart "Head to Head: Companies Compete on Service and Reliability" shows comparative scores

SMALL BASES

While Willard & Schullman was tabulating our surveys, we asked for data on several monitor manufacturers who have not received as many as 75 responses each. Although the data on these companies is not as reliable as the numbers we report in company score boxes, we thought we should share the results with you. We can't give you exact figures, but we can tell you this much:

CTX International comes out slightly worse than average for reliability, much better for tech support and repair service. An average proportion would buy CTX monitors again.

NCR Corp. earns a slightly better-than-average rating for reliability, and scores much better than average for tech support and repair service. An average proportion would buy NCR monitors again.

Panasonic receives a slightly better-than-average rating for reliability, and much better ratings for tech support and repair service. A percentage much larger than average would buy Panasonic units again.

Samtron gets a slightly below-average rating for reliability, with lower-than-average scores for tech support and repair service. Likewise, a slightly lower-than-average percent would buy Samtron monitors again.

EDITOR'S CHOICES—FROM THE READER'S SCREEN

Several Editor's Choices from past issues show up among the respondents' most popular choices. In particular, NEC Technologies' line of MultiSync monitors have received the Editor's Choice nod several times, and they show up prominently in our survey results. The NEC JC1401P3A MultiSync was a two-time Editor's Choice Winner (*PC Magazine*, March 25, 1986, and March 31, 1987); it receives a reliability rating of 97 on our survey. The NEC MultiSync 3D was Editor's Choice earlier this year (May 15, 1990); according to our survey respondents, the reliability of this monitor rates a 95.

Two Princeton Graphic Systems monitors, the Princeton Ultrasync and the Ultra 16, earned Editor's Choices in two consecutive years (May 31, 1988, and February 14, 1989). Many survey respondents have purchased a related model, the Princeton Ultra 14 (also called the Ultrasync 14). They give this unit a reliability rating of 92.

Finally, the Zenith ZCM-1490 was

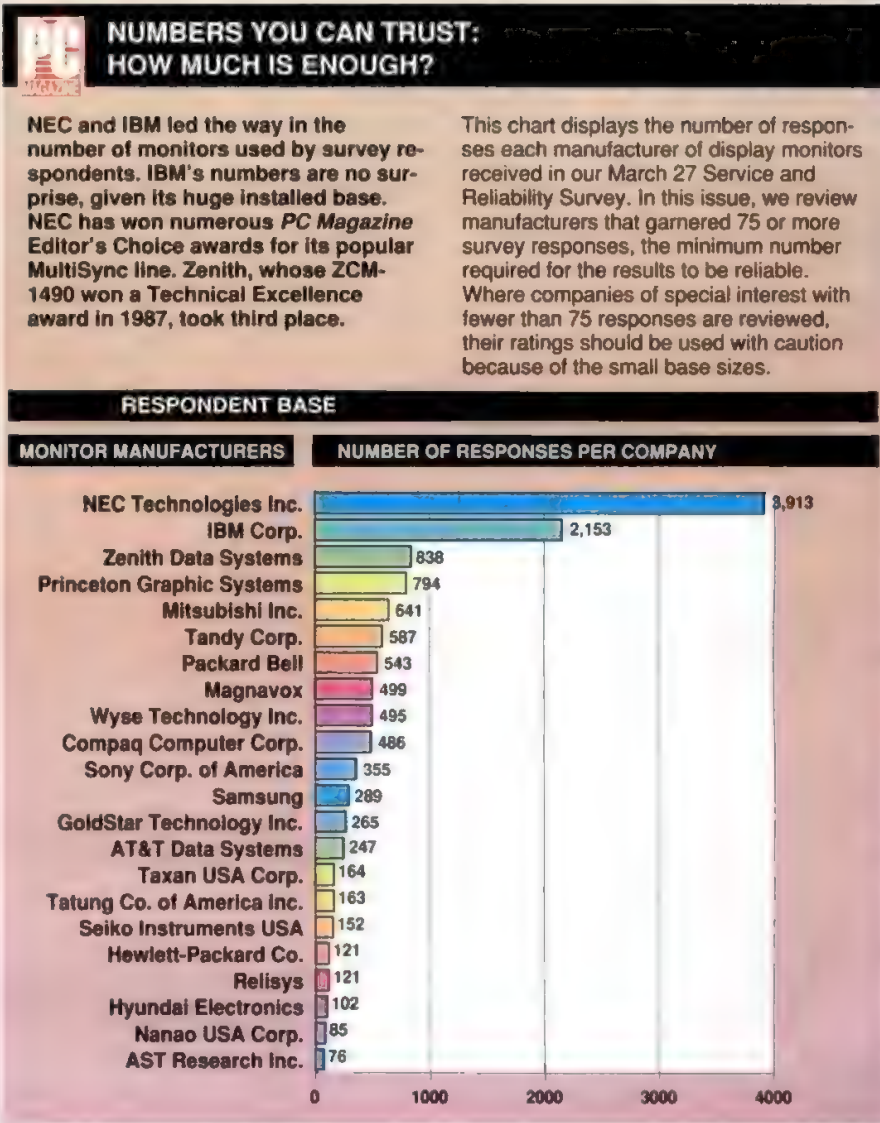
voted Best of 1987 and received a Technical Excellence Award in the same year for the flat tension mask (FTM) technology it introduced (January 12, 1988). This monitor, however, seems to be erratic in day-to-day operation; it earns a reliability rating of 85. Nevertheless, users seem to like the monitor when it is operating soundly.

TEARFUL RESOLUTIONS

A good idea for preserving the life of a display monitor—especially one of the older types—is to use a screen saver program that will blank the screen to prevent screen images from getting etched into the phosphors on your display (see "Screen Savers: Longer Life for the Monitor and a Feast for the Eyes").

No responsible report on monitors can end without mentioning the health effects that some experts have been warning about in recent years. Can the electromagnetic radiation that video display terminals produce really affect the cell tissue of users? Can screen glare actually weaken the eyesight? These questions have not been conclusively resolved.

Nevertheless, it's a good idea to take the precaution of staying 4 feet away from your monitor when it's in operation, and to adjust the viewing angle to make it as comfortable and as free of glare as possible. Also remember to give your eyes some relief by shifting your gaze to other parts of your office or the papers on your desk rather than staring at the screen continuously. We certainly want you to be able to keep reading *PC Magazine* for a long time to come.



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by Karen Best

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▲ Actual score ▲ Average score □ High-low range

AST Research makes its own PCs, monitors, and software. From its home base in Irvine, California, the company has recently made some bold moves into overseas markets, trying for a place of its own in tough markets like Japan, the Soviet Union, and India.

AST monitors compare favorably with the other displays represented in our survey. On one of the key questions—"How would you rate the product for overall reliability?"—respondents give these monitors good marks, consistent with the high scores that were earned by monitor companies overall.

A high proportion of respondents indicate that the monitors have lived up to their original expectations. Some AST customers compare the displays with those from competing manufacturers. "To my eye, AST's VGA color monitor has sharper images and colors than Compaq's VGA color monitor," says Michael Sherman, president of Association Research Inc. in Rockville, Maryland.

When asked, "Would you buy a product from the same manufacturer again?" 79 percent of the respondents who have purchased AST monitors say yes. Again, that's about equal to the overall percentage for all companies in our survey.

AST customers participating in our survey are a little less satisfied when it comes to calling the company's tech support staff. One reason is that AST lacks an 800 number. A customer calling from a large corporation with a correspondingly ample bankroll probably wouldn't care much about the absence of toll-free tech support. But for someone telephoning from a limited-budget business or from home, an 800 number becomes a virtual necessity. If the customer's question happens to be complicated and requires a lengthy

SERVICE AND RELIABILITY MONITORS

reply, the answer can turn out to be expensive.

What does AST have to say about its tech support? The company claims that its technicians resolve more than 95 percent of all problems on the phone. And any PC user with a modem can call AST's 24-hour BBS system, free of any charge beyond the normal long-distance rates. For repairs, customers obtain service from AST's authorized resellers or from any of about 1,200 authorized service centers.

THE FAILURE RATE

The biggest problem area for AST monitor owners in our survey is the frequency of problems in the past 12 months. The average response for all companies indicates 5 malfunctions. AST monitor users who did have problems complain that on an average of 15 occasions in the past year, their monitors were impaired or unusable.

The same set of respondents rate the severity of a typical problem as slightly more serious than the typical gripe of the average monitor owner in our survey. Christine Rivera, president of Micro Dynamics Plus (a computer training center in New York City), describes her story: "I purchased an AST VGA monitor at the end of last year. About one month after the purchase, the characters on the top of the screen were too long and the characters on the bottom too short. I was told the monitor had to be replaced. Since it was more than 30 days after purchase, the monitor had to be returned to AST via a distributor. This took three months! I had to purchase another monitor while waiting. Six months later the VGA card failed and had to be replaced. Overall, I was very dissatisfied with AST."

A product manager for AST says that normally, for every 100 systems shipped, only one is returned for service during the warranty period, which is an unusually generous five years. Unfortunately, there was a high failure rate among a batch of roughly 1,500 monitors that shipped out last December. AST traced the problem to a vendor of one of the components in the monitor who was not meeting standards. AST honored the warranty and has replaced many of the faulty displays.

Despite these problems, most of our survey respondents seem satisfied with AST quality, service, and reliability. Here are a few examples:

"I have recommended AST hardware for my firm since 1987, and we are all extremely happy with it," says Tom Palmaki, a PC analyst in Rochester, New York. "Overall, I am very pleased with AST equipment," says Michael Golding, a jewelry store manager in Seattle, Washington. And Harold M. Goldner, an attorney in Philadelphia, Pennsylvania, states decisively, "I would not hesitate to purchase another AST machine."

A high percentage of our survey respondents would agree with him.

CIRCLE 648 ON READER SERVICE CARD

AT&T Data Systems

by Michael Cohn

COMPANY SCORES



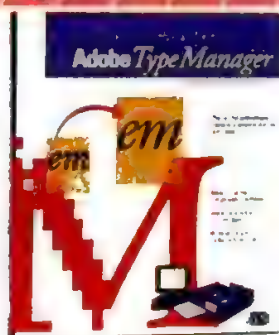
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(800) 922-0354
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▲ Actual score ▲ Average score □ High-low range

In the years since the breakup of the phone company, AT&T has established itself as a presence to be reckoned with in the computer industry. Its line of display monitors does not number many models, but because of the popularity of AT&T PCs, the company's monitors have found their way onto many users' desks. Reliability has long been one of the company's bywords, and the ratings that *PC Magazine* survey respondents give to the monitors testify to this commitment.

The company scores a high mark of 94 for reliability, compared with an average of 92 for monitor manufacturers overall. Meanwhile, the percentage of respondents who report that they have ever experienced a problem of some kind comes out below the average for all monitor companies. Out of that small number, a comparatively high percentage tell us their monitors have been functioning properly for at least the past year. Our respondents have been using an AT&T monitor for an average of three years.

Satisfaction with tech support performed both by AT&T and by its retailers rates higher than the average. As with the



Adobe Type Manager

(Adobe)

ATM allows Windows 3.0 applications to display and print high-quality text at any size, automatically. ATM brings scalable PostScript font software to the PC display and non-PostScript printers for the first time. Use any point size at any time, without having to quit your application to run a font generation utility. ATM requires only minutes to install and works transparently with Windows 3.0 applications. **\$59.**



CorelDRAW! 1.2

(Corel Systems Corporation)

CorelDRAW! is fun and easy to use. Fit text to a curve, kern letters on screen, rotate, stretch, skew copy, and combine. Over 100 typefaces and over 300 pieces of clip art. FREE! Now a new program, called CorelTRACE, is bundled in at no extra cost. Converts bitmap images into vector graphics, handles large TIFF files, is quick, and does not require additional memory. **\$319.**

DESQview 386

(Quarterdeck Office Systems)

DESQview brings multitasking and multi-windowing into your DOS environment. Sort your database in the background, calculate spreadsheets in the foreground and simultaneously print files from your word processor without ever having to open or close a window. Supports expanded memory and includes API for multitasking program design. **\$118.**



Expert Mouse

(Kenington)

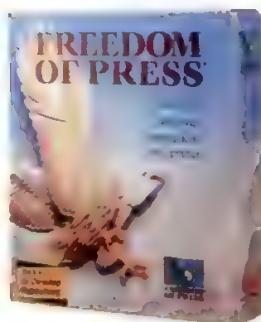
The Expert Mouse takes mouse technology beyond the traditional mouse to a quicker, more comfortable and easier type of input device. Expert Mouse works with Windows, is 100% Microsoft Mouse compatible and is now available in serial and BUS versions. **PS/2: \$105. Serial: \$112. BUS: \$124.**



Freedom of Press

(Custom Applications Inc.)

Deliver the highest resolution results capable of your printer at a fraction of PostScript-ready printer prices with Freedom of Press by Custom Applications Inc. Print PostScript-Language files on non-PostScript color printers. Experience true font scaling, exceptional disk management, automatic printing, bar graph interpretation, and imaging status, all compatible with your current desktop publishing software. **\$249.**



Drafix Windows Cad

(Foresight Resources)

Drafix Windows CAD, a true, high performance CAD developed specifically for Windows. An impressive roster of drawing tools including associative dimensioning, hatching and fill, multiple interactive viewpoints, a powerful macro language, background redraw, entity attributes, database manipulations and much more to make Drafix a must for the professional and casual designer. Now works under Windows 3.0. **\$435.**

PC-Kwik Power Pak 1.5

(Multisoft Corp.)

Power Pak is a performance enhancement program that gives dramatic improvement to any PC, XT, 286, 386, 486 or PS/2 running DOS. It centers around the award-winning Super PC-Kwik Disk Accelerator. This cache provides advanced disk reading and writing technology and supports RAM-based disk caches as large as 16 megabytes. Integrated with the cache are RAM Disks, Print Spoolers, a Screen Accelerator with screen ReView feature, and a Keyboard Accelerator with a DOS command-line editor. **\$70.**



CIRCLE 225 ON READER SERVICE CARD

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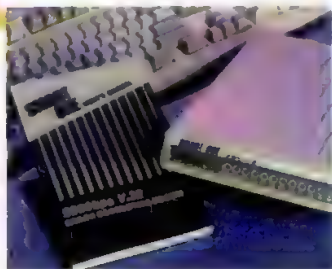
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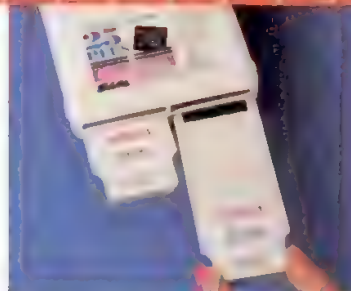
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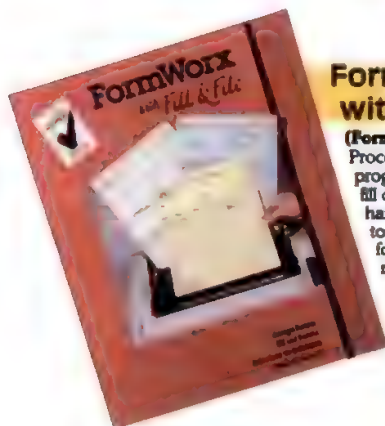
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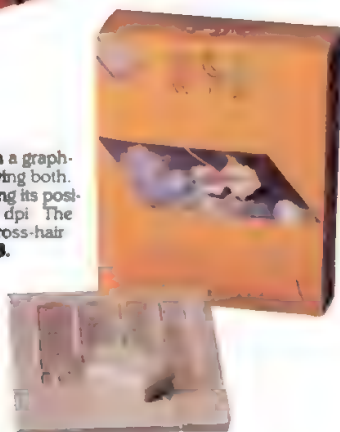
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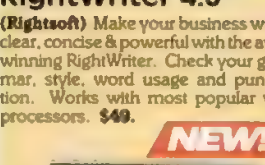
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HINTS OF DISCONTENT

Despite the generally upbeat attitude that *PC Magazine* survey respondents show towards AT&T's monitors, a few signs of dissatisfaction surface in the survey results. For example, the small proportion of respondents who have experienced a problem with AT&T monitors characterize the severity of their problems as a bit higher than average. No one problem stands out among the answers they are giving us. But one statistic does seem to clash with the other data: only 63 percent of survey respondents say they would buy an AT&T monitor again. This is not really a bad figure, but it is significantly lower—in fact, by 17 percentage points—than the average of 80 percent we find among all monitor manufacturers.

Why would AT&T users go anywhere else? One possibility might be that MIS departments can easily justify purchasing AT&T products in bulk because of AT&T's widespread reputation for reliability; therefore its computers could end up on the desks of many users who might not specify the same brand themselves. The Department of Transportation, for example, ordered about 40,000 workstations from AT&T last December. But this theory is not borne out by the survey results. When we look at the proportion of respondents who claim responsibility for choosing the specific manufacturer and model, the results are the same for AT&T monitor users and for all monitor users in general (77 percent).

To judge from the comments that many readers have written on their surveys, the price is the decisive factor for those monitor users who say they would not buy from AT&T again. Dr. Andrew M. Wiesenthal, a physician coordinator in Denver, Colorado, writes regarding his AT&T PC 6300 and AT&T monochrome graphics monitor: "The AT&T has been wonderful and was actually far superior to the IBM PC when I bought it. Time and my needs have passed it by, but the company has kept pace neither in design nor price with the industry. That is why I do not plan to buy another AT&T." Since returning the survey to us, Dr. Wiesenthal has given

SERVICE AND RELIABILITY MONITORS

away his AT&T and upgraded to a 386 from another manufacturer. In response to such comments, an AT&T spokesman says, "We don't just sell boxes; we sell quality, value, and reliability."

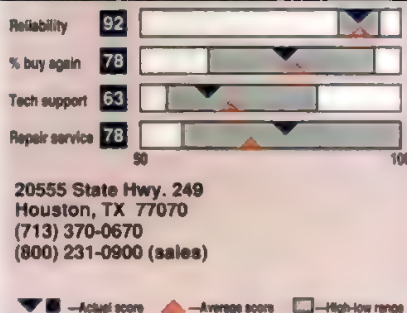
Price may well outweigh AT&T's reliability and service ratings for survey respondents faced with the choice of which monitor to buy next. Other companies do receive comparable ratings for customer satisfaction, along with a higher percentage of respondents who would be glad to buy from them again. High quality and satisfactory support count with many consumers, but the cost of the product can never be ignored.

CIRCLE 649 ON READER SERVICE CARD

Compaq Computer Corp.

by Michael Cohn

COMPANY SCORES

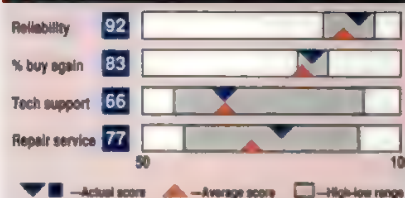


Most people who own Compaq monitors also own the PCs that go with them. Compaq has long competed with IBM in its PC line by trying to stay ahead of the industry leader and introducing the latest technology whenever it can. In the area of system units, the Compaq Deskpro 386 had the distinction of being the first PC to run on an 80386 processor. For the operating system, Compaq added support for hard disk partitions over 32MB and bundled this with its PCs as Compaq MS-DOS 3.31. And for the video display system, Compaq's Video Graphics Controller Board conformed to the PS/2 standard but featured a full 16-bit interface while IBM and most other card manufacturers were still chugging along at 8 bits.

How do readers rate the reliability of Compaq's equipment? You can flip to other sections of this issue for survey

Compaq Computer Corp.

VGA monitors



respondents' opinions about Compaq's desktop and laptop systems. In the monitor category, Compaq displays comes out about average. But note that the average is a not-too-shabby 92 points out of 100.

When asked whether they have ever had a problem with their Compaq monitors, 14 percent of the respondents say they have. This figure also equals the industry average, according to our results. Out of the 67 respondents who have experienced a problem with their Compaq monitors, a higher-than-average proportion of them say the problem rendered the monitor either impaired or unusable at some point during the past 12 months.

COMPANY POLICY

As most Compaq customers know, the manufacturer actually provides very little in the way of repair service. Compaq informs us, "We feel that the best level of support and service is provided through the dealer channel."

The standard Compaq warranty covers one year on parts and labor, but Compaq-authorized dealers usually perform the repair and support functions themselves. Compaq furnishes its dealers with a training program, dealer certification, and a newsletter. The company also expects dealers to stock parts. On-site service depends on the dealer as well. Some offer it, some don't, and some can arrange it through a third-party organization.

As Compaq does not offer its own tech support or repair service as a rule, survey respondents have generally been forced to find other ways to fix monitor problems. Respondents who have used third parties (such as on-site service providers) for tech support show a high rate of satisfaction. Those who have tried using departments within their own companies to perform repairs express less satisfaction with their handiwork.

These results suggest that third parties providing tech support for Compaq monitors are a viable option, while in-house technicians in the user's own workplace

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Peachtree Software

may not be equipped to perform repairs on Compaq displays. Gary B. Schnoor, an office manager at the Good Shepherd Home in Cornelius, Oregon, writes, "I'm responsible for in-house maintenance of all our equipment. We've had excellent results with Compaq and Epson."

Schnoor lists his retailer as his contact for technical support. "We've always gone through BusinessLand. If it's something we can do ourselves, that's fine, but when it comes to replacing disk drives or something like that, I use the local dealer. You've got to be able to draw the line between whether you should try to fix it yourself and have a lot of downtime or bring it in and let them fix it for you."

A Compaq spokesman responds, "The dealer is the primary focus of service and support. However, in-house service departments can purchase spare parts from a Compaq dealer."

Overall, about 78 percent of the respondents with Compaq monitors say they would buy from the company again, which puts Compaq roughly on a par with monitor vendors overall.

COMPAQ VGA

In reviewing the Compaq Video Graphics Color Monitor (May 31, 1988), *PC Magazine* wrote, "Compaq has once again created a product that surpasses IBM's in quality while retailing at a significantly lower price." The following year, we gave the Compaq Monochrome Video Graphics Monitor a write-up (August 1989). Our reviewer gave it the nod, calling it a "competent performer" for Compaq customers who want a VGA monitor and prefer monochrome (or find it easier to afford).

Neither of these monitors, nor any other Compaq VGAs, received enough survey responses for us to evaluate the reactions to them separately. The best we can do is to consider the Compaq VGA monitors as a group; collectively, they garnered 288 responses.

Few of the reliability scores stand out from the average earned by VGA monitors overall. The average reliability rating for the Compaq VGA stands at 92, the proportion of monitors with problems at 14 percent, and the average problem severity rating at 69.

As in the overall Compaq monitor ratings, the one major reliability score that differs significantly from the overall VGA average is the percentage of problems that have occurred during the past year. Of

those Compaq VGA users reporting problems, 93 percent indicate that their monitors were impaired or unusable at some time during the past 12 months; the score for all VGA monitors would be 75 percent.

THE DEALER CONNECTION

Survey results confirm that repairs done by retailers and third parties on Compaq monitors have a better chance of satisfying you than those done by in-house departments. Likewise, turning to a retailer

would support its products more directly. Michael J. Hopkins, the electronic point-of-sale coordinator for Chief Auto Parts in Arlington, Texas, writes: "Compaq needs to break away from dealing through dealerships. Its equipment, while superb, is too expensive to ignore the need for direct product support. It needs to become more user-friendly."

"Compaq needs to open up lines to technical support," he adds. "If you want to put a new component in the machine that isn't made by Compaq and you go to ask your dealer about whether it will be compatible, the dealer tells you he will put

"Compaq needs to break away from dealing through dealerships. Its equipment, while superb, is too expensive to ignore the need for direct product support. It needs to become more user-friendly."

for tech support will probably prove more gratifying than getting advice from an in-house department.

This ties in with Compaq's policy of providing support through the dealer channel. A technical specialist at a Sears Business Center in Colorado says of his experiences working in the retailer channel: "From both personal and work experience, I would always choose Compaq. When I need tech support, I talk with someone *now*. Even if I have to wait for a few minutes, I always get correct answers the first time, and right now, today. If I call another company, I might get a call back tomorrow or the next day. Not good enough! Compaq training for dealers is excellent."

Most readers find the service they have received through dealers satisfactory. Jim Hartford, an intelligence coordinator with the Department of Corrections in Walla Walla, Washington, writes of his Compaq unit: "After a VGA monitor malfunction was noted, it was quickly and courteously replaced by the retailer [ComputerLand] within 72 hours. We've received excellent service through the dealer. I simply called sales and told them I have a malfunctioning VGA monitor and they sent me a new one."

Not all respondents have had equally positive dealer experiences. Many survey comments express the wish that Compaq

a message on Compaq's BBS. You'll wait a week, and then Compaq will just tell you something like 'it's not compatible,' not how to make it compatible. I found out in one case that I just needed to change the BIOS."

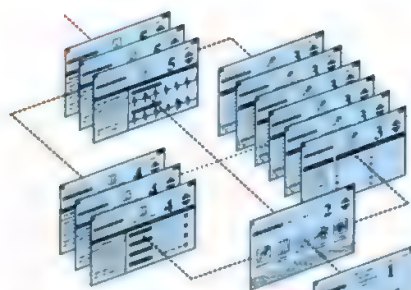
Hopkins concludes: "Compaq's are probably the best-built and most reliable machines. The quality control is excellent. Compaq just needs to pull the price down some, make it easier for people to afford these components."

Only rarely do users have success in persuading Compaq Customer Service to attend to them directly. A spokesman for Compaq says: "We don't deal directly even with major accounts. If there's an issue that comes up while the end user is working with the dealer, if there's some dissatisfaction, the end user could call us and we would work to resolve the problem, but that doesn't happen too often. We work very hard at offering dealer training classes. The dealer can come to Compaq for advice if a problem is more technical in nature. We have a dealer locator service to help customers find different kinds of dealers. But the dealer is still the channel of distribution."

In answer to some readers' charge that parts from other manufacturers can't be used with Compaq equipment, Compaq says: "We have always been compatible with the industry standards. Obviously

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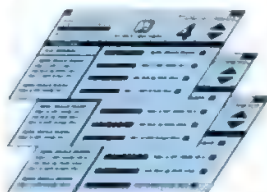
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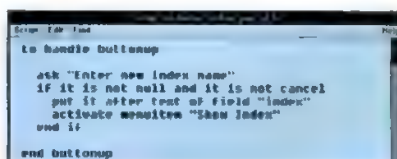


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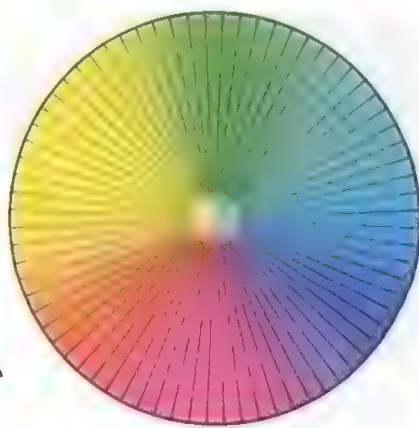


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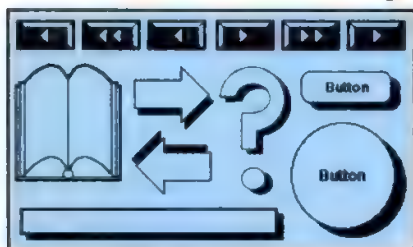
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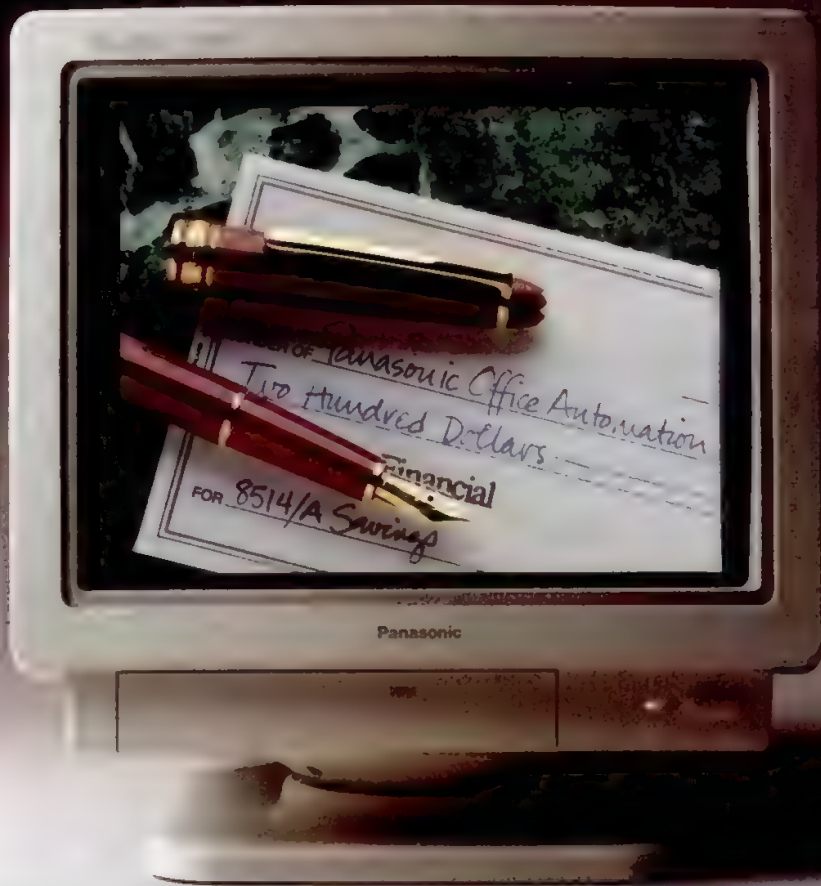
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MONITORS

we have some specific innovations; that's part of our success. But we design to meet the end user's needs with all the testing we do before and after a new product goes out the door. Our products are tested with different hardware and software environments."

Does that mean that add-in boards from other companies should work with Compaq equipment? Compaq replies, "As long as they're industry standards, we work with them."

Still, 83 percent of the Compaq VGA users say they would buy Compaq units again. That number is roughly in line with the proportion for VGA monitors from all manufacturers. Thomas Schmitz—a CAD/CAM coordinator with Giddings & Lewis Machine Tool Co. in Fond du Lac, Wisconsin, and the owner of a Compaq Deskpro 386S and Compaq VGA display system—writes, "I wish I could buy a car like my computer equipment."

CIRCLE 650 ON READER SERVICE CARD

GoldStar Technology Inc.

by Susan G. Thomas

COMPANY SCORES



3003 N. First St.
San Jose, CA 95134
(408) 432-1331
(800) 777-1193 (sales)
(800) 777-1256 (technical support)

■ Actual score ▲ Average score □ High-low range

When we reviewed GoldStar VGA monitors for our issue of May 15, 1990, we found them steady, reliable values. Apparently, the 265 GoldStar owners who responded to our survey agree with us. In our survey, GoldStar monitors score about average on reliability and customer loyalty. What can you say about monitors that are... well, average and dependable?

"They're good monitors," says Lynn R. Powell, a product manager at Inland Steel in Highland, Indiana. Powell, who bought a GoldStar color VGA two and a half years ago, says that his monitor has never given him any problems; he didn't even have to call GoldStar's technical

support line for help in setting it up. "Compared with the other monitors I've worked on, the GoldStar monitor I have now is much better," Powell says. "The resolution is better, and the controls are right up front, which I like." Powell's only problem with his monitor has been an occasional color intensity change.

Ron Smith, a sales associate at Tide-Air Inc., of Cypress, Texas, bought his GoldStar EGA in August 1988 and hasn't had any problems with it to date. Smith says that his monitor has "very good color and reliability." The only GoldStar feature that has bothered him is the monitor's "larger-than-usual lettering, which," he says, "took some getting used to."

Neither of these problems provoke comments from any significant portion of the respondents who own GoldStar monitors. The question then is: What exactly is GoldStar doing right?

Nothing in particular, it seems; just doing a good job. GoldStar's toll-free technical-support hot line is attended from 11:00 A.M. to 8:00 P.M., E.S.T., and customers can spend an unlimited amount of time talking with technicians about their monitor problems. Yet more survey respondents have opted for their dealers' technical support rather than help from the manufacturer. They express their satisfaction with the retailers' support by rating it slightly above average. Among the respondents who have used it, ratings for GoldStar's technical support come out below average.

DIFFERENT SOURCES OF SUPPORT

OEMs and mail-order companies such as CompuAdd frequently include GoldStar monitors in the systems they sell. Instead of calling GoldStar itself for monitor difficulties, customers are likely to call the technical-support hot line at the company that manufactures or distributes the major components of their systems.

The manufacturer's lower-than-average rating for technical support could be due to some confusion about whom to call for help. When a video problem can't be attributed to either the card or the monitor, how do you know which company is best equipped to answer your question—the manufacturer of the card, the monitor, the system unit, or the dealer? Whatever the case, most survey respondents fared better with technical support when they went directly to their dealers.

Similarly, among GoldStar monitor users who have answered our survey, those who went to the retailer for repair service seem better satisfied than those who went directly to GoldStar. Nevertheless, GoldStar does try to ensure speedy return of the monitors sent in for service. A GoldStar spokesman says, "We have a third party take care of repair service, and we require the company to fix and return products to customers in 48 to 72 hours."

The overall problem incidence for GoldStar monitors is slightly below average—but a low problem incidence is a good thing. At the production stage, GoldStar has a double testing system to ensure high quality in its monitors. According to GoldStar, "Our products are tested twice—first in Korea, where they are assembled. Then we check them again in our warehouse in Los Angeles just to make sure." The double-stage testing evidently works.

Overall, according to our survey, GoldStar monitors are a good deal: dependable units that most survey respondents would be willing to pay for again.

CIRCLE 651 ON READER SERVICE CARD

Hewlett-Packard Co.

by Carolyn Falconer

COMPANY SCORES



9425 Canoga Ave.
Chatsworth, CA 91311
(818) 773-4400
(800) 733-4411 (technical support)

■ Actual score ▲ Average score □ High-low range

Laser printers are probably what comes to mind when you think of Hewlett-Packard Co. Its success, however, is not limited to the printer arena. HP offers a wide range of PC products and peripherals, including monitors. What do our survey respondents think of the reliability of these monitors and the support and repair service provided with them?

Survey results indicate that people are generally happy with both their monitors and Hewlett-Packard's service. Only 8 percent of our respondents report having had a problem with an HP monitor, a

figure that compares favorably with the overall monitor average of 14 percent. Those who do report problems rate tech support and repair service far above average. Technical support receives high marks, scoring a 78, or 11 points above the average. Repair service also exceeds the average score by a wide margin. Survey respondents award Hewlett-Packard and others they have turned to for repairs on HP monitors with a high 86, while the average score is 71.

The company's attitude toward service could account for its high satisfaction ratings. A spokesman for Hewlett-Packard says, "Nothing is more important than having a satisfied customer." Hewlett-Packard offers a wide range of support, but many of its most convenient offerings are open to support-contract customers only. While contract customers can dial a toll-free number 24 hours a day for technical support, regular customers are able to obtain help only between 6 A.M. and 9 P.M. Eastern time (and then only if they are willing to shoulder the cost of a lengthy phone call to California). Nevertheless, HP service people sometimes make exceptions for regular customers. Debbie Reynolds of Bryan, Texas, has a monitor that broke down twice within

LIMITS OF ENTHUSIASM

Although service and tech support receive exceptional marks, only an average number of respondents (79 percent) say they would buy a monitor from Hewlett-Packard again. One explanation might be that only 60 percent of the respondents using HP monitors have selected this brand for themselves. Most of these machines are provided by companies to their employees. Since corporate needs differ from personal ones and personal purses differ from corporate ones, many people would likely turn to another brand when buying for their own use.

Those who have experienced problems with their monitors provide further clues as to why some HP customers would not buy from this manufacturer again. Of the 8 percent of respondents who report problems, 90 percent indicate that the problem occurred within the past 12 months. This figure rises well above the average figure of 69 percent for all monitors; this ties in unmistakably with HP's low buy-again scores. And while the average severity rating of problems for all monitor companies numbers only 57, Hewlett-Packard scores a severity average of 72. In the light of the

A regular customer whose monitor broke twice in the warranty period remarks,
"I received great service from an HP representative who normally provides service only to commercial clients."

its warranty period. Her comment: "I received great service from an HP representative who normally provides service only to commercial clients."

A standard one-year manufacturer's warranty, including both parts and labor, covers Hewlett-Packard monitors. Technicians at Hewlett-Packard's own location often perform repairs, but authorized dealers do most of the servicing. Dealers must stock replacement parts as one requirement for authorization. Hewlett-Packard maintains both dealer training and dealer certification programs that include documentation and video training. HPNN, the Hewlett-Packard News Network, keeps dealers up to date on the newest HP technology.

low overall problem incidence and high scores for satisfaction, the severity and the fact that the problems mentioned were relatively recent would help to account for the repeat business scores being only around average.

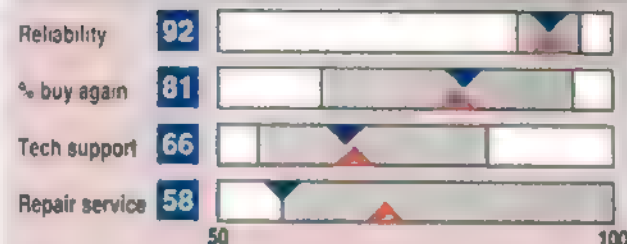
With a reliability rating of 95—slightly above the average—HP finds itself in a prime position on our survey. Hewlett-Packard says: "The ultimate in reliability and quality goes into development from the beginning." Fortunately for HP, it's easy to imagine that a company that continues to satisfy its customers with the best possible support, service, and products will remain a foremost contender in the future.

CIRCLE 652 ON READER SERVICE CARD

Hyundai Electronics

by Michael Cohn

COMPANY SCORES



166 Baypointe Pkwy.
San Jose, CA 95134
(408) 473-9200
(800) 678-8817 (sales)
(800) 234-3553 (technical support)

—Actual score —Average score □—High-low range

Hyundai Electronics America is a division of Hyundai Electronics Industrial Co., the rapidly growing South Korean chip supplier and PC manufacturer (as well as auto maker). It produces a line of display monitors that includes CGA, EGA, VGA, and monochrome models. Like Samsung Information Systems and Gold-Star Technology, Hyundai is part of a new breed of up-and-coming computer industry giants from the nations known as the Four Tigers of the Pacific Rim.

The 102 survey respondents who use Hyundai monitors give the company a reliability rating of 92, equal to the high average that monitor companies achieve overall. The problem incidence comes to 14 percent—again equal to the overall monitor average. Satisfaction ratings for technical support similarly fall in line with the average for all monitors.

But the story doesn't end as simply as that. For one thing, respondents report that a high proportion of their Hyundai monitors have been impaired or unusable in the past year. Jose Obrador, a field engineer with Idea Servcom in Miami, Florida, had problems with a bad power supply in his Hyundai EGA monitor, which he purchased with a Hyundai 16TE machine. "When I first got the machine," he says, "I ran the system diagnostics and got an error for the video. A week later, the monitor died. The dealer, Computer Bank, replaced the monitor rather than trying to repair it."

According to Hyundai, newer displays utilizing more-advanced technology are being sold now. "At Comdex, Hyundai announced new monitors," says a company representative. "As a result of some new techniques, improvements have been incorporated into the line."

Hyundai normally provides repair ser-

AFTER 15 YEARS
IN THE COMPUTER BUSINESS,
TANDON OPENS 426 MILLION
LOCATIONS NATIONWIDE.

SERVICE AND RELIABILITY MONITORS

vice only through the dealer channel. Two people went to direct marketers and found their service abilities lacking. Among all sources for repairs, only the retailer and in-house repair departments received average ratings or better.

Some 47 percent of the Hyundai monitor users report that Hyundai does not provide a technical-support hot line, and they are correct up to a point. Hyundai supplies such a number, but only to its dealers. The company follows a policy of concentrating its customer service efforts through the retailer channel. It runs a bulletin board service for dealers and distributes a newsletter to them. It also offers dealer certification and training programs, but it doesn't strictly require its dealers to stock replacement parts.

Some respondents still feel that the dealer channel is insufficient when repairs are needed. One respondent in Wesson, Massachusetts, complains that his EGA system had washed-out characters and colors that ran, adding: "Hyundai's maintenance support is next to non-existent. I would not, under any circumstances, recommend this system to anyone."

IMPROVING RELATIONS

Hyundai's establishment last April of a customer relations department should help to calm such misgivings. According to the company, complaints like these were one reason it introduced the department. Nevertheless, the customer relations people normally won't be going over the heads of dealers to supply service.

In defining the role of the new depart-

tions with regards to a dealer in their area, we can make references to other dealers or contact the dealer and help resolve the problem. We take it on a case-by-case basis. We would like a problem to be solved with the original dealer, but if the end user finds that unacceptable, we'll provide the user with an alternate avenue of service."

Indeed, many survey respondents seem to have received good service for their Hyundais from the retailer channel. James G. Rickett, a license investigator with the City of Las Vegas's Department of Business Activity, states: "About six to nine months after purchase, I noticed the voltage on the monitor started to drop. The edges of the display began to show a sine wave pattern, and on a bright screen display, the image got wavy and hard to read. It turned out to be a problem with the power supply. The local dealership replaced it immediately."

Rickett goes on to say, "Dealer support has been wonderful. We've had experience with a wide range of Hyundais. The reliability of the original machines was not good, but the replacements have worked well. I imagine that's from screams from the dealers. We especially like the 18-month warranty."

Hyundai feels that its augmented dealer service program is a strong one. The company solicited suggestions from authorized dealers and made changes to the telephone system, expanding the hours for ordering parts and getting technical support. Hyundai says, "A recent survey

mechanic from Green River, Wyoming, writes: "The Hyundai we purchased has served our needs, and our children enjoy using it. It has never failed or broken down. We upgraded the monitor to EGA for ease of viewing text files and for use with CAD programs."

Despite some problems, users find Hyundai displays mostly reliable, and Hyundai says it is working to improve its dealer service. Its tentative moves into bettering customer relations will be welcome for those who like to know they can call on the manufacturer when they can't get satisfaction from a local dealer.

CIRCLE 653 ON READER SERVICE CARD

IBM Corp.

by Michael Cohn



IBM often seems like the proverbial 500-pound gorilla in most segments of the PC market. It defined the standard of the personal computer, and although many successful rivals have sprung up in its shadow, Big Blue's adherents still constitute a legion of computer purchasers. For them, IBM remains the unshakably safe choice. Across all the various IBM monitor lines, our survey results show that assumption to be generally correct.

PC Magazine survey respondents give IBM a high reliability rating of 91 for its monitors, about the same as the high average rating we found for monitors overall. IBM monitor users constitute one of the largest shares of our survey respondents—2,153 people, second only to the number of NEC users.

The percentage of IBM respondents who report ever having had problems with their monitors is only slightly higher than the average: 18 percent compared with 14 percent. Within this group, however, a greater-than-average portion rate the problems they experienced as very serious.

Hyundai concentrates on customer service through the retailer channel. It prefers that problems be solved with a user's original dealer but will provide alternatives.

ment, a Hyundai representative says: "We encourage end users to utilize dealers for the first level of support. We try to support the dealers, and we want them to stay involved in providing service as well as the product. Most dealers are more than happy to.

"Our customer relations department was established to provide an avenue for resolution of problems should end users not find satisfaction. If users have ques-

of our dealers indicates that the changes have been well received. Hyundai will continue to improve the services that are provided to both the dealers that represent us and the end user."

In all, 81 percent of the respondents with Hyundai monitors affirm that they would buy again from the company. This proportion is about the same as for monitor users overall who have answered our survey. Steve Eleshut, a heavy-equipment

VISIT THE ONE NEAREST YOU.



When Tandon entered the computer business 15 years ago, most users only wanted price/performance. That's what we delivered. And today there are more than 600,000 Tandon systems installed worldwide.

Now state-of-the-art products aren't enough. You want a choice in how you purchase, service, and support your computers. So we're responding with the state-of-the-art in customer satisfaction. Now you can choose how you purchase and service your computers: direct from Tandon or through a Tandon business partner (resellers/dealers).

Either way, you get outstanding Tandon systems featuring innovative Tandon technology. Robust, reliable, price-competitive computers that have made Tandon's most recent sales growth greater than even Compaq and Apple. Technologically advanced computers that lead the industry in power and performance. Computers that must pass stringent manufacturing and quality checks before they wear the Tandon label.

And you choose the level of service and support that's tailored - and priced - to your specific needs.

Buy direct from Tandon and you've got our promise of helpful, knowledgeable, no-pressure sales assistance, prompt delivery, telephone technical support, one-year limited warranty, and a no-exceptions 30-day moneyback guarantee.

Buy from an authorized Tandon business partner, and you'll be working with fully-trained systems professionals, ready to provide everything from planning, installation, training and support services to applications development,

system customization, network design, and multi-vendor solutions.

Take a close look at the outstanding lineup of Tandon computers featured in the following pages. Then call us. We'll not only help you select the system that's right for you. We'll help you select the best way to buy it.

A COLORFUL REASON TO ORDER BEFORE SEPTEMBER 30.

With each Tandon system you buy before September 30, 1990, we'll send you a 10-pack of premium-quality Tandon diskettes in a rainbow assortment of colors. Once you experience the convenience of Tandon color-coded diskettes, you'll want more, so re-orders are available in quantity.

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BRIGHT ENOUGH

STANDARD FEATURES

3.5-inch high-density, double-sided 1.44 MB diskette drive also reads 720 KB diskettes.

40 MB IDE hard drive.

(LT 386sx) 16 MHz 80386SX processor;

(LT 286) 12 MHz 80C286 processor;

keyboard selectable clock speeds.

1 MB memory, diskette drive, video controllers, IBM®-compatible parallel and RS-232-C serial ports, optional math co-processor socket on main board.

Built-in single screen system setup utility automatically configures diskette drive, security, standby mode, ROM shadowing, serial and parallel options; easy selection of security levels, external peripherals, and routine functions such as date, time, language, etc.

Monochrome backlit liquid crystal (LCD) video display with 16 shades of gray can be set to write dark characters on light

background, or light characters on dark. I/O port supports

external color or monochrome VGA™ (LT 386sx) or EGA™ (LT 286) monitor.

82-key keyboard emulates 101-key keyboard with embedded keypad and 12 function keys; password security; supports external keyboard and 10-key keypad.

TANDON LT 286™: LAP UP THESE FEATURES. \$2499.

The Tandon LT 286 features many of the innovations that we've built into the Tandon LT 386sx. All of which makes for an outstanding 286-based laptop. In fact, our dual-panel LCD technology delivers an EGA video refresh rate which *PC Magazine* reports is "among the fastest in its class."

Tandon's innovative selectable ROM shadowing is also incorporated in the Tandon LT 286, providing significantly faster execution of ROM-based instructions.

Add the same energy conservation features we provide on our LT 386sx, and you've got more than a laptop you can live with. You've got a laptop you'll love. Call today and lap one up.



TO GO PLACES.

TANDON LT 386sx™ PUTS A HANDLE ON POWER. \$2899.

Even most desktop systems don't pack the power of Tandon's LT 386sx laptop. Beneath the sleek, slim case, a full 32-bit internal 386SX™ processor purrs confidently at 16 MHz. Accompanied by a generous 40 MB hard disk, 1 MB RAM (expandable to 5 MB,) and rechargeable battery.

The backlit VGA monochrome display provides outstanding graphic resolution, with up to 16 shades of gray, and operates with light-on-dark, or dark-on-light characters, as you prefer. Dual-panel LCD technology not only makes the display one of the brightest of any laptop, but refreshingly fast on video refresh - a significant consideration for users of Microsoft Windows™, CAD software, desktop publishing, and the other powerful graphic applications for which the Tandon LT 386sx is eminently suitable.

A unique Tandon innovation provides selectable ROM shadowing, which is another way of saying it copies instructions from ROM memory to much faster RAM. What that means to you is significantly faster execution of ROM-based instructions.

Energy conservation is on everyone's mind these days. The Tandon LT 386sx does its part, with selectable lower clock speed, and standby mode: automatic or manual turnoff and reactivation of the hard drive and screen as needed.

Add the optional spacious, stylish carrying case, and you're ready for a power lunch. Order in your Tandon LT 386sx today.



STANDARD FEATURES (cont.)

LED indicators for low battery, fixed and diskette drive operation, keyboard status (Num, Caps, and Scroll Lock).

Proprietary 16-bit expansion slot with AT®-bus and RS-232-C signals.

Autosensing AC adapter/charger accepts 100 to 265 VAC input; Nickel-Cadmium battery pack provides 2 to 3 hours portable operation, depending on battery conservation techniques employed.

Built-in speaker with programmable, IBM-compatible sound.

Dimensions: 12.7 in. wide by 13.6 in. deep by 3.4 in. high. Weight 14.5 lbs.

System unit and power/adaptor cord, operation and installation manual, Tandon MS-DOS 3.3 loaded on fixed disk.

OPTIONAL FEATURES

Custom fabric carrying case, 2 MB memory modules (to 5 MB total), external numeric keypad, external 5.25-inch diskette drive, Tandon MS-DOS diskette and manual, Windows™ 3.0, serial mouse

Tandon LT 386sx/40, VGA
\$2,899

Tandon LT 286/40, EGA
\$2,499

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CIRCLE 508 ON READER SERVICE CARD

Tandon

Where it pays to be direct

THE THIN LINE THAT SEPARATE

STANDARD FEATURES

3.5-inch high-density, double-sided 1.44 MB diskette drive, or 5.25-inch 1.2 MB diskette drive.

Two-speed 8/16 MHz 80386SX processor (SL 386sx);
Two-speed 8/25 MHz 80486 processor (SL 486); keyboard
selectable clock speeds.

1 MB memory, diskette drive controller, video controllers, IBM-compatible parallel and two RS-232-C serial ports, optional math co-processor socket on main board.

Built-in single screen system setup utility automatically configures diskette drive, security and serial and parallel options; easy selection of security levels, external peripherals, and routine functions such as date, time, language, etc.

Universal 101-key enhanced layout, low profile with 12 function keys; LED indicators for Num Lock, Caps Lock, and Scroll Lock Keys; password security.

TANDON SL 386sx™ PUTS POWER ON YOUR DESK WITHOUT TAKING IT OVER. \$2100.

We've combined Intel 80386 power, technology and features with unique Tandon innovations to deliver outstanding performance in a compact, slimline package.

Full 32-bit internal processing means that the Tandon SL 386sx (the SL stands for slimline) will run your existing applications faster. While its advanced instruction set lets you also move up to advanced multitasking software and applications, such as Windows 3.0. Of course, all 386SX systems will do that. Here's why ours does it better:

A proprietary Tandon chip called MIAT™ (which stands for Mapper-Integrated AT) provides a higher level of systems integration. But don't let the buzzwords baffle you. What we're talking about is fewer components and greater reliability.

The low profile, small footprint package doesn't dominate your desk, yet contains more than enough internal expandability for most applications. For which you can thank another aspect of the Tandon SL 386sx: communications ports and mass storage controllers are all resident on the main board.

And that's enough innovation to keep most users happy for a long, long time.



S US FROM THE COMPETITION.

TANDON SL 486™ IS ABOUT AS MUCH POWER AS ONE PERSON CAN HANDLE. **\$4399.**

If computers were cars, this one wouldn't be designed yet. We've put the awesome power of the Intel 80486 chip in a slimline package to produce the ultimate single-user power machine. Not to mention an extremely economical way to put 486 technology at your fingertips. And it's no slouch when it comes to networking, either.

As you may know, 486 technology combines the 80386 instruction set, numeric coprocessor and 8K memory cache on a single chip. All of which frees up the memory bus from data read bottlenecks, and results in faster operation.

But with the input bottleneck removed, the next place your programs can get bogged down is - you guessed it - output. So

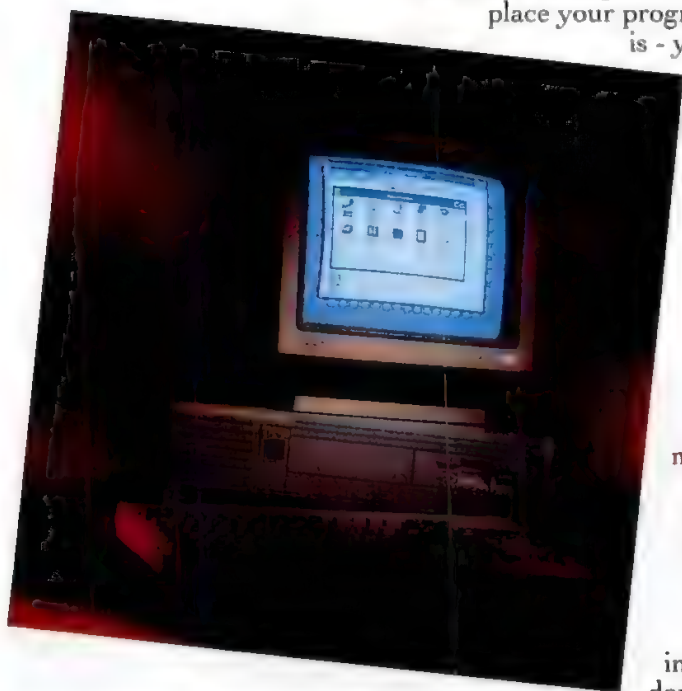
in the Tandon SL 486, we've added an exclusive new feature to nip that problem in the bud: the PowerPoster™.

This is our brand name for an intelligent buffer that speeds write operations to RAM. Another advantage of the PowerPoster is that it eliminates the need for the more expensive external cache memories found on some of our competitors' 486 systems. And leads a step closer to the Holy Grail of computer design: greater price/performance.

The Tandon SL 486 also incorporates two other Tandon innovations that we hope

you're becoming familiar with: Tandon's Memory Mapper, providing Flex Shadowing™ of RAM for faster processor performance, and the MIAT chip for greater integration, and resulting higher reliability.

If you're a power user considering a high end 386-based system for compute-intensive applications such as CAD, graphics, or large spreadsheets, the Tandon SL 486 was designed to win you over.



STANDARD FEATURES (cont.)

Two 5-1/4 inch and one 3-1/2 inch drive bays.

Personal password protects data and software.

Three 16-bit AT-compatible expansion slots and one XT™ compatible slot.

130-watt, fan-cooled power supply; switchable to 115 volts or 230 volts.

Built-in speaker with programmable, IBM-compatible sound.

Dimensions: 18.3 in. wide by 16 in. deep by 5 in. high.
Weight 31 lbs. (SL 386sx); 32 lbs. (SL 486).

System unit, keyboard, power cord, operation and installation manual, Tandon MS-DOS software and manual.

OPTIONAL FEATURES

SL 386sx and SL486:
Memory modules (to 5 MB total).
Windows 3.0 (Windows 3.0 and Microsoft Serial Mouse are included with all configurations of 2 MB or more), 80387SX math co-processor (SL 386sx); 110 MB or 200 MB IDE fixed disk, serial/bus.

Tandon SL 386sx \$2,100.
Tandon SL 486 \$4,399.

Both systems include
MB RAM, 40MB IDE drive,
VGA monochrome monitor,
16-bit video card.

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CIRCLE 312 ON READER SERVICE CARD

Tandon

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WARP FACTOR

STANDARD FEATURES

Desktop Models:

5.25-inch high-density, double-sided 1.2 MB diskette drive or 3.5 inch, high density, double-sided 1.44 MB diskette drive.

(Tandon 386 and 486 Towers include both drives).

386: Two-speed 8/25 or 8/33 MHz 80386 processor, keyboard selectable clock speed. (8/33 only on Tandon Tower).

486: Two-speed 8/25 MHz 80486 processor, keyboard selectable clock speed.

386: 1 MB 32-bit memory, socket for Intel 80387 or Weitek™ math co-processor; 64 KB static RAM cache.

486: 2 MB 64-bit memory (4 MB on Tandon Tower 486), socket for Weitek math coprocessor, PowerPoster write buffer.

Built-in system setup utility automatically configures memory expansion, diskette drive, security and serial and parallel options; easy selection of security levels, external peripherals, and routine functions such as date, time, language, etc.

Universal 101-key enhanced layout, low profile with 12 function keys; LED indicators for Num Lock, Caps Lock, and Scroll Lock Keys; password security.

386: Serial/parallel adapter requires one expansion slot; RS-232-C serial port; IBM-compatible parallel port.
486: Two RS-232-C serial ports and one IBM-compatible parallel port.

386: One 32-bit memory slots; six 16-bit AT-compatible slots; one 8-bit XT-compatible slot.
486: Six 32-bit EISA slots (AT-compatible with adapter cards); two 16-bit AT-compatible slots.

NEXT TO THE TANDON 486™, EVERYTHING ELSE IS A SECOND-RATE POWER. **\$6599**

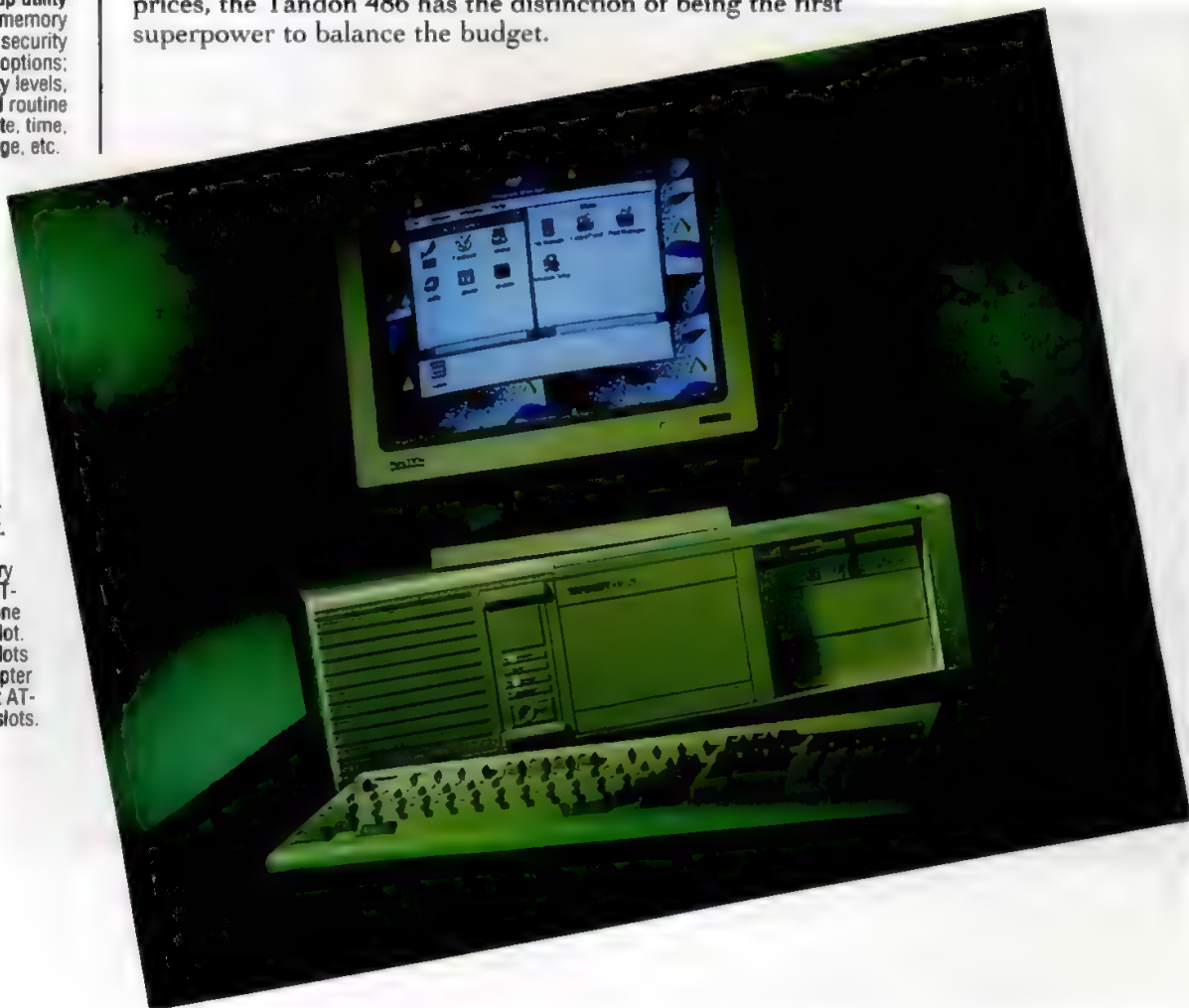
The Cold War may be over. But the computer war is just heating up. And the balance of power has definitely shifted to the Tandon 486.

That's because we've pulled out all the stops. And combined Intel 80486 technology with unique Tandon innovations to create a machine that *PC Computing* calls "a hot ticket for performance junkies."

Unlike 486-based systems with plug-in CPU boards, we designed the Tandon 486 from the ground up around the Intel 80486 processor. We not only support burst mode read cycles (which can almost double data input speed), we also incorporate double-wide (64-bit) memory bus and Multi-CACHE™ external cache memory to further accelerate read operations.

But the crowning touch is the way we eliminate output bottlenecks - the Achilles Heel of many other 486 systems. Tandon's proprietary PowerPoster, a smart write buffer, bursts most write operations to RAM. PowerPoster has a cost benefit too, because it reduces the need for large amounts of expensive cache memory. Tandon has looked into the future to provide the new EISA bus, boosting peripheral performance to previously unheard of levels. And yet maintains full compatability with your current AT-bus cards.

By offering true workstation performance at personal computer prices, the Tandon 486 has the distinction of being the first superpower to balance the budget.



9, MR. SULLU.



TANDON 386™ TAKES IT TO THE LIMIT.

\$3799 AND \$4199.

Tandon's full-function 386 systems take advanced 80386 technology as far as it will go.

And that's all the way to a blinding 33 MHz processor speed, with 16 MB of directly addressable memory. All on a 32-bit bus.

But we're still not satisfied. So we employ Tandon technology to squeeze out even greater performance. Using our innovative selectable ROM shadowing, we load the ROM instruction set into faster

RAM for enhanced performance. And adding 64 KB of cache memory to speed memory access. So get to the transporter room on the double. And beam us up.

TANDON TOWER 386 AND TANDON TOWER 486 - TOWERS OF POWER. \$5945 AND \$8354.

If your desktops are being taken over by systems that are being used for departmental computing, network servers, and multi-user platforms, you're ready for a Tandon Tower.

The Tandon Towers contain all the features and performance of our desktop 386 and 486 systems, but in free-standing tower units that fit unobtrusively under a desk or table.

Yet the Tandon Tower units are roomy enough to accommodate eight half-height (four full-height) bays and a 250-watt power supply will keep you growing for a long time.

When you're ready to reach the top, take the Tandon Tower.



STANDARD FEATURES (cont.)

386: 190-watt, fan-cooled power supply; switchable to 115 volts or 230 volts.

486: 230 watts.

Tandon Tower: 250 watts.

Built-in speaker with programmable, IBM-compatible sound.

Dimensions: 21.1 in. wide by 16.3 in. deep by 6.3 in. high.

Weight 39.9 lbs;

Tandon Tower: 10.2 in. wide by 19.6 in. deep by 26.1 in. high. Weight 70 lbs.

System unit, keyboard, power cord, operation and installation manual, Tandon MS-DOS software and manual.

OPTIONAL FEATURES

Windows 3.0 and Microsoft Serial Mouse are included with all configurations of 2 MB or more.

386: 1 MB and 4 MB memory upgrade kits (to 16 MB); add-in memory daughterboard, 80387 math co-processor, Weitek math co-processor; 200 MB IDE fixed disk; 330 MB ESDI fixed disk, serial/bus
486: 2 MB and 8 MB memory upgrade kits (to 64 MB). Weitek math co-processor; 330 MB and 600 MB SCSI fixed disks; (Tandon Tower: 1 GB SCSI fixed disk); 650 MB ISO-approved optical disk cartridge drive.

Tandon 386/25 \$3,799
Tandon 386/33 \$4,199
Tandon 486/25 \$6,599
Tandon Tower 386 \$5,945
Tandon Tower 486 \$8,354

All desktop systems include 110MB IDE fixed drive, VGA monochrome monitor, and 16-bit video card. All Tandon 386 and 486 Tower systems include 330 MB SCSI fixed drive, VGA monochrome monitor and 16-bit video card.

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CIRCLE 541 ON READER SERVICE CARD

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MONITORS

For example, about 86 users say that their IBM monitors would not work, were broken, or failed.

For a large, diversified manufacturer like IBM, service ratings probably signify more than companywide reliability statistics. Among the IBM monitor users who have answered our poll, satisfaction with technical support comes out exactly in line with the average for monitors overall: a 66 rating for tech support from IBM itself, and 67 for tech support provided by any source for IBM monitors.

25 percent of the IBM monitor users know of IBM's tech-support hot line, while 4 percent say they have actually used it. IBM's hot line is open for a fee to accounts with 25 systems or more when enrolled in the company's End User Support Program. IBM operates a bulletin board service for the same customers. Also, many CompuServe users are familiar with the IBM Network (IBNET) forums on-line. The forums are not officially affiliated

with IBM, but the company recognizes them as an authorized user group.

Of course, tech support forms only one part of the service picture. We also asked about satisfaction with repairs. Overall, IBM monitor users give the company higher satisfaction ratings for repair than the average: 68 for repairs done by the company itself, compared with 62 for monitor manufacturers overall. IBM offers a one-year parts-and-labor warranty that entitles customers to bring their monitors to authorized service centers for



SCREEN SAVERS: LONGER LIFE FOR THE MONITOR AND A FEAST FOR THE EYES

by Christopher Stetson

Hardware advances have brought spectacular speeds to the desktop PC and high resolution to the display monitor. As the computing power at the desktop increases, colorful graphical user interfaces are replacing the familiar black screen and C: prompt with company logos and .PCX images as backdrops.

Running a GUI on the display also means having the electron gun in the back of the monitor constantly exciting the phosphors on the screen. Monochrome monitors can develop *ghosting*; this means that when an image stays on a set of pixels for a long time, it can burn itself onto the screen permanently, leaving what looks like a ghost after the screen image is cleared. Many people want to be sure that this phenomenon does not happen to their relatively expensive color monitors as well. Ghosting is most common with images that remain on the screen constantly, like desktop patterns. Although phosphor technology has advanced considerably, burned-in images make a screen more difficult to view, and problems with a monitor can cause eyestrain, headaches, and related health problems.

Screen savers help prevent these problems. They come in two varieties, *screen blankers* and *screen animators*. Screen blankers work by turning off or dimming the screen, keeping any image from constantly gunning the pixels. Screen animators put animated sequences on the screen and thus keep images from staying on a set of pixels.

In the DOS environment, screen savers generally come in the form of

memory-resident screen blankers. Probably the best-known screen blanker is *VGA Dimmer* (\$29.95; Revolution Software, 320 Route 24, Chester, NJ 07930; (201) 455-0995). It will blank just about any screen, including Hercules video display systems, which were rumored to have overheating problems with some earlier screen blankers. You can program the screen to go blank after a specified period of keyboard inactivity, or you can use a hotkey to invoke the screen blanker. Screen blankers generally occupy a small amount of RAM—3K or less—and you may find them useful for security (keeping people from seeing your work) as well as for saving the screen. Some can be placed into high memory using 386MAX or similar systems.

In OS/2 and now Windows 3.0, where memory limitations are not as critical, animated screen savers are beginning to appear. For example, John Ridges's public-domain program for the OS/2 Presentation Manager, *Deskpic*, combines a screen saver with a desktop picture program. (The two *Deskpic* files, DSKPIC.ZIP and DSKEXT.ZIP, are available in PC MagNet's PCM:PROGRA forum, library 2, or in CompuServe's CIS:MSSYS forum, library 1.) Screen-saver animation modules for *Deskpic* include Spaceflight, Flex (a bouncing geometric figure), Melting Flex, and Fade to Black. With its extensible features, OS/2 PM programmers can write their own *Deskpic* screen-saver animation sequences and picture readers.

Several screen savers will soon mi-

grate from the Apple Macintosh platform. Screen animators have been around for a long time in the Mac environment, and users commonly devote upwards of 62K to screen savers. One of the biggest players is *Pyro!* (\$40; Fifth Generation Systems, 10049 N. Reiger Rd., Baton Rouge, LA 70809; (800) 873-4384, (504) 291-7221), which contains over fifteen modules, with variable controls that make the animation possibilities seem endless. The most popular animation sequences include Aquarium, showing fish swimming across the screen and gobbling each other up, and String Theory, exhibiting trails of squares bouncing inside an imaginary box. *Flowfazer* (\$49.95; Utopia Grokware Inc., 300 Valley St., #204, Sausalito, CA 94965; (415) 331-0714), created by rock star programmer Todd Rundgren and David Levine, includes a module called Shock that will wake you up if you have been staring into the screen when it comes on. Expect to see a lot of these programs heading to the PC platform.

Beyond the question of how useful or necessary they happen to be for a given monitor/adaptor combination, screen savers can look quite spectacular. They can be used to make a computing environment more friendly, like the standardized desktop pattern in Windows 3.0, or as a tool to keep expensive hardware from losing its value. Even if phosphors were resistant enough to withstand being etched by anything less than a chisel, screen savers would still be found on many desktops because of the variety and enjoyment they provide. ■

SERVICE AND RELIABILITY MONITORS

repair. For a fee, a customer can upgrade a warranty from carry-in to on-site service. After the warranty period ends, IBM offers maintenance agreements at varying prices.

Some interesting differences show up in the user profile. Survey respondents with IBM monitors have been using their displays an average of 6 months longer than the typical monitor user: 26 months compared with 20. In addition, a smaller proportion of IBM monitor users were originally responsible for selecting the specific manufacturer and model they use: 72 percent, compared with 77 percent for monitor users overall.

Overall, 78 percent of the IBM monitor respondents say they would buy again from the company, a proportion that's close to the average for monitors from all manufacturers. One reason may well be the IBM reputation for service, which is borne out by our monitor survey. As Richard Pape, general manager of Software Center Management in Boise, Idaho, puts it, "IBM has the absolute best service agreements in the business. They were always on-site within four hours, and if they did not have the part, it was air-freighted in and installed the very next morning. We use IBM computers exclusively because they have the best service and are extremely dependable."

An IBM spokesman replies: "From our internal studies, the level of customer satisfaction is high in all areas. IBM places a very high premium on the level of service. That's one reason customers become repeat customers."

IBM VGA MONITORS

A fairly high proportion of IBM monitor users among our respondents have opted for some of the best display technology the company has to offer. Among the 2,153 IBM monitor users who have written to us, 1,154 of them work with VGA displays. They allot competitive reliability and tech-support ratings to the monitors, and they report superior IBM repair service.

IBM introduced the Video Graphics Array standard when it rolled out its PS/2 line in April 1987. With the new machines, IBM offered a choice of monochrome, with the Model 8503, and color displays, including the Model 8512 and Model 8513 monitors profiled below. The 8514/A display adapter it introduced later in 1987 allowed its Model 8514 to work at 1,024 by 768 interlaced resolution.

Overall, the IBM VGA line earns a reliability rating of 89; the problem incidence is 21 percent, and 80 percent of the IBM VGA respondents say they would buy from the company again. Compared with VGA users overall, a slightly lower proportion of IBM VGA users report that their monitors have been impaired in the last 12 months.

Beyond its good repair service scores, IBM must be doing something right where

IBM Corp.

VGA monitors



Model 8512



Model 8513



EGA monitors



CGA monitors



Monochrome monitors



Legend: ■ Actual score ▲ Average score □ High-low range

its VGA monitor users are concerned. About 80 percent of those who filled out our survey say they would buy again from IBM. This favorable figure coincides with the average percentage for VGA monitor users overall.

Customers keep coming back to IBM equipment for many reasons, some of which are voiced by Gerald Benny of the Department of Plant Pathology at the University of Florida in Gainesville: "The only problem I ever had was that the monitor [a Model 8503-001] arrived with a short in it. I called the technical representative, and IBM air-freighted out a replacement at their cost. It only took a day or two for the monitor to arrive. I've had no problems with the monitor since it was changed. I think the service and support is fine, but IBM should be competitive pricewise." Benny's department continues to buy from IBM partly because of the superior service and support, and partly because of Florida state contractual arrangements.

IBM MODEL 8512

IBM's Model 8512 hit the market in April 1987, at the same time that Big Blue debuted its PS/2 line. You probably saw it sitting on the desks of some of the "M*A*S*H" crew members who appeared in IBM's commercials playing the early users of the PS/2. Perhaps they're the ones to blame for the so-so scores that the Model 8512 earns in our survey.

We received responses from 222 users of the 8512. It garners a pretty good reliability rating of 88, about the same as the rating for VGA monitors overall. We decided to compare the 8512 (and the Model 8513 profiled below) with VGA monitors because even though it can work with IBM's 8514/A video adapter card, its maximum resolution is only 640 by 480 pixels.

In our survey, 23 percent of the Model 8512 users report ever having had a problem, which again is roughly in line with the percentage for VGA monitors overall. Among those who have experienced problems, a substantially smaller proportion of Model 8512 users say their monitors were either impaired or unusable at least once in the past year. Unfortunately, among those users who say they ever had a problem with the 8512, a greater proportion of them rate its severity as very serious.

No particular problem dominates on our survey, but we received several re-

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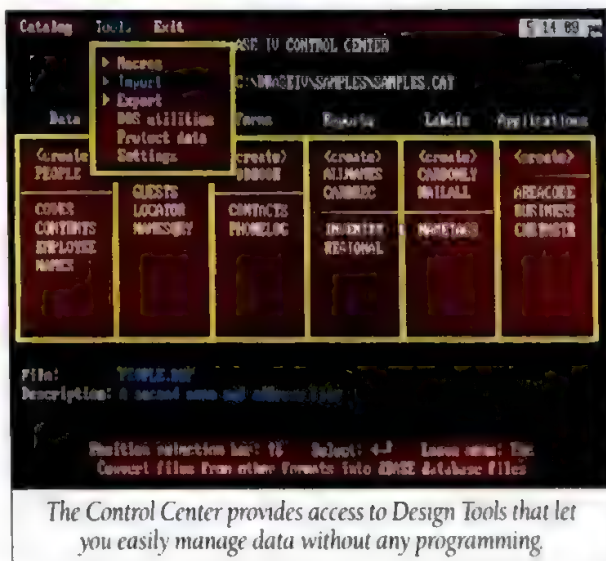
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ports of the screen flickering, going out of focus, blanking out, and in a few cases failing completely. About 8 survey respondents complained that their 8512s lost color, and about a dozen of them couldn't get it to work at all.

For instance, Barry N. Brookshire, a control engineer at Motor Panels in Kings Mountain, North Carolina, tells us that his

monitor like the Model 8513 also generates satisfaction with IBM as a vendor. 80 percent of the Model 8513 respondents say they would buy again from IBM, a proportion in line with the average for the typical VGA monitor manufacturer as well as for the Model 8512.

IBM claims that "the level of customer satisfaction is high in all areas. IBM places a very high premium on service. That's one reason customers become repeat customers."

Model 8512 had one problem: "We walked in one day and there was a yellow screen with black writing on it. We wiggled the cables and that fixed it for a while, but the problem kept recurring. We sent it off for repair, and when it came back, the problem was fixed."

Despite these difficulties, 81 percent of the Model 8512 respondents say they would buy from the manufacturer again—the same as the figure for VGA monitor respondents overall.

IBM MODEL 8513

The Model 8513 was introduced with three other members of the 8500 series of monitors when IBM launched its PS/2 series back in April of 1987. The company positioned this one as a midrange color display, between the purely utilitarian Model 8512 and the harbinger of resolutions to come, the 8514. According to survey results from 766 respondents, users find the Model 8513 reliable, and they feel pleased with the tech support and repair service.

The Model 8513 rates on a par with the 8512 and with IBM VGA displays in general in terms of its reliability score (88) and the proportion of users who have experienced problems (21 percent). The Model 8513 also approximates scores for the IBM VGA in terms of the proportion of monitors that were impaired or unusable at least once in the past year. In other reliability categories such as the incidence and average severity of problems the Model 8513 seems a safer bet than the 8512, but not by a significant amount.

With the good will it generates for tech support and repair, a popular, reliable

Major Allan C. Nelson, chief of the Engineering Division at the U.S. Air Force base in Honolulu, says of his Model 8513: "Six to eight months ago, my little ol' monitor failed out of the blue. Since it was well out of warranty, I figured I would have to buy a new one. But the guys at IBM looked at the serial number and said, 'You're in luck.' For these early monitors there was some kind of tech bulletin. They replaced the monitor the very next day. They even delivered it to my house. I thought that was outstanding."

IBM EGA MONITORS

IBM's EGA monitors overall garner a reliability rating of 88, about on par with the average for EGA monitors from all manufacturers. The incidence of problems is 22 percent of IBM's EGAs, which is above the overall EGA average. But among these monitors that have had a problem at some time, a high proportion have suffered from impairment or been unusable in the past year.

52 percent of the IBM EGA respondents say they have been using their monitors for over three years. Only 14 percent of the EGA users overall can make that claim.

Another interesting statistic is that a higher-than-average proportion of IBM EGA monitor respondents work with used monitors: 13 percent compared with 6 percent. These used monitors could be a factor contributing to the high percentage of recently malfunctioning displays.

Gerald Zuckier, a research associate in the Yale Medical School Physiology Department in New Haven, Connecticut, has been using his IBM Enhanced Color Monitor for over four years. He informs us that the monitor's power supply eventually died. "I had a long wait for IBM monitor parts," he says. "I had to reorder a couple of times. They didn't have a schematic diagram. They suggested I bring it to an authorized center that would have charged to swap it out. I eventually brought my EGA downstairs to an in-house, departmental mechanical shop. It was cheaper than getting IBM or the university computer center to fix it." An IBM spokesperson declined to comment on our findings for its EGA monitors.

Overall, 75 percent of the IBM EGA respondents say they would buy from the company again. This percentage is nearly as high as the proportion for EGA respondents overall.

IBM CGA MONITORS

IBM offered CGA monitors as an option with its early IBM PCs. Many users have stuck with their IBM CGA monitors for several years, and they give the monitor (and IBM) above-average reliability and tech support ratings.

On the *PC Magazine* Service and Reliability Survey, 177 IBM CGA monitor users assign the monitors an average

"IBM replaced the monitor the very next day. They even delivered it to my house. I thought that was outstanding."

Possibly the lengthy time IBM EGA users have stayed with their monitors causes this high percentage of recent problems. Among our survey respondents, the average length of usage for IBM EGA monitors is 39 months, compared with 23 months for typical EGA users. Moreover,

reliability rating of 97, which is slightly better than the average for CGA monitors overall. The problem incidence, at 8 percent, also comes out slightly better than average. Several other reliability ratings derived from the problem incidence figure also represent positive findings. These

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include the percentage of monitors that worked properly, the low percentage that were impaired or unusable in the past year, and the average severity rating of a typical problem.

As with IBM EGA monitors, the average length of usage exceeds the norm considerably: 46 months for IBM CGAs, compared with 30 months for CGA monitors from all manufacturers. 59 percent of the IBM CGA respondents have been using their monitors for over three years;

IBM MONOCHROME MONITORS

IBM's monochrome monitors date back to the original, the venerable PC-1, the personal computer that started the ball rolling in the open-architecture, IBM-compatible world. For the most part, IBM's monochrome display adapter (MDA) monitors win average reliability and service ratings, or better, and the length of time they have been used turns

IBM offers a service agreement that makes it the sole source of support, even for competing manufacturers' equipment.

compare this with 27 percent for CGA respondents overall. Also, much as with IBM's EGA monitors, a higher-than-average proportion of users work on used CGA monitors. Unlike the case with IBM's EGA monitors, however, the proportion of problems with the average IBM CGA display does not seem to have grown in relation to the average length of usage or proportion of second-hand units.

When asked whether they would buy from the same manufacturer again, 76 percent of the IBM CGA monitor respondents say they would. This figure is slightly above the average for CGA users overall.

Robert Smallback, DP manager for the City of St. Cloud, Florida, had positive experiences with tech support for his IBM Model 5214 color monitor. He says, "We have had only one problem with the monitor, a shrinking of the screen, and when we called IBM they swapped it for us. We have an agreement with them for all of our IBM equipment."

Smallback informs us of several interesting service agreements offered by IBM, including one that makes IBM the sole source of support for an organization, even for competing manufacturers' equipment. "There's been a change in IBM's attitude towards the third world other than Big Blue," he says.

IBM acknowledges its multivendor service program. "Customers began coming to us a few years ago, saying they wanted some assistance with service in a multivendor account," a spokesman says. "We'll call the vendors for the client or use a third party. If it's our own equipment, we service it ourselves."

out to be really extraordinary. Nevertheless, surveys indicate that relatively few mono users would be interested in buying from IBM again.

The average reliability score for these displays is 96, while 12 percent of the IBM mono monitors have ever had a problem. Both figures line up with the averages for mono monitors overall. Among the monitors with problems, the proportion of IBM monos that were impaired or unusable in the past year is lower than the overall average, as is our respondents' rating of the typical severity of those problems. 10 out of 24 who experienced problems rate them as minor. Only 7 consider the problems very serious.

All of this should be encouraging news if you plan to buy an MDA monitor from IBM. But we're not sure that this would be many readers' next buying choice. Indeed, our survey results indicate a comparatively low proportion of IBM monochrome users who plan to buy again from the same company.

One reason for their discontent may be the extraordinary length of usage for their monitors, 52 months on the average. 65 percent of respondents have had IBM mono monitors staring them in the face for over three years, and 18 percent inherited used monitors. No wonder they want a change. But such a long duration of usage, problem-free for all but 12 percent of the respondents, merits distinction in its own right.

Curiously, a fairly average proportion of respondents, 78 percent, say their IBM mono displays still meet their needs. Those who say this expect the monitors to con-

tinue to meet their needs for an average of 30 months—about as long as the typical monitor user projects for a display. Perhaps the reason for not buying again from IBM isn't really the length of usage at all; instead, respondents may just wish to avoid Big Blue's big prices if they ever need to buy a monitor again.

Vernon H. Ferris, from Jacksonville, Florida, reports that his IBM monochrome Model 5151 meets his needs, but he adds, "I'm not sure how much longer I will keep it. We are supposed to upgrade. The monochrome we've got here has a green screen and is easy to view. Nothing wrong with it, but it's monochrome." He indicates that he will not be buying from IBM again. "Nothing wrong with the manufacturer," he says, "but it's overpriced for what you can get in compatible items. People pay a higher price just because of the IBM name."

In general, users who are willing to pay for IBM service agreements like the support they get. IBM monitors earn good reliability ratings, although IBM EGAs don't fare as well over time.

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Magnavox

by Julie Cohen

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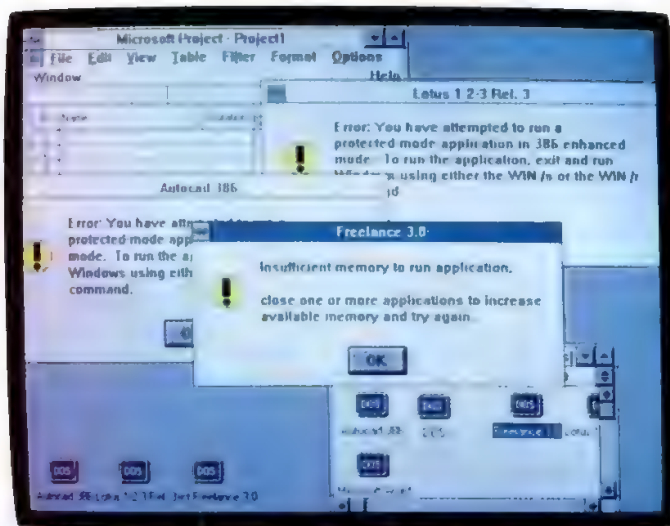
Actual score Average score High-low range

When you consider Magnavox's solid reputation and Philips Consumer Electronics Co.'s long history in the television business, it should be no surprise that users of Magnavox monitors who answered our survey consider them dependable, basic components.

It might come as a surprise, however, that satisfaction with Magnavox's technical support comes out somewhat below average among respondents. Nevertheless, a greater-than-average proportion say they would buy again from Magnavox. Perhaps Philips has customers who con-

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This comparison was made using a system like the one you might run: Both shots show an ALR FlexCache 33/386 running DOS 3.3 with VGA display adaptor, Novell NetWare v3.01 Rev. A, with IPX/SPX v3.01 Rev. A, Microsoft Mouse 7.00, and Microsoft SMARTDrive v3.03 disk cache. Buffers were set to 20. For the Windows screen, we ran Microsoft Windows 3 HIMEM.SYS and EMM386.SYS. For the DESQview screen, we ran QEMM 386 v5.1.

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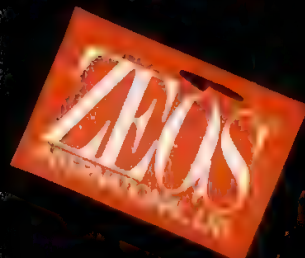
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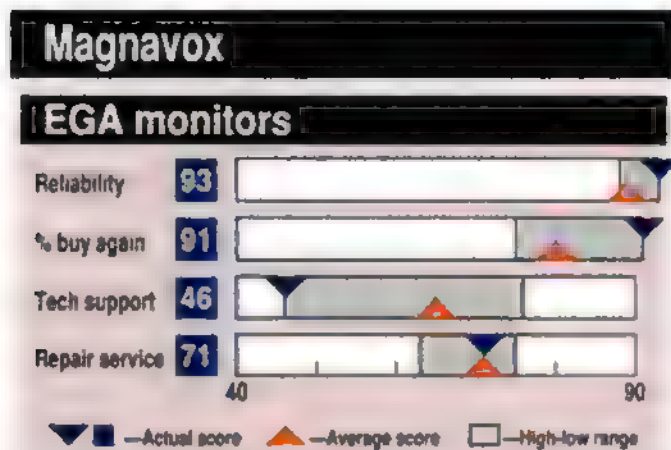
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CIRCLE 145 ON READER SERVICE CARD

SERVICE AND RELIABILITY MONITORS



sider the Magnavox brand name reason enough to return to the manufacturer when it's time for a new monitor.

Philips relies on a network of 7,000 authorized service centers to handle repairs. If some respondents who have written to us had their way, however, the company would offer on-site repair, dealer service, and a 24-hour-a-day toll-free technical-support line. The company has no toll-free number; it offers technical support between 8:00 A.M. and 7:00 P.M. E.S.T. "Anybody who sells this kind of product should offer a live-body response operation," says John Teeter, an executive with Hell Graphic Systems, of El Toro, California. "There are a lot of people in far-flung places who do their computer work at night, and it would be nice to have a human being to talk to."

In fact, Philips says it is dedicated to granting some of these wishes by developing a repair training program that will include new videotapes and comprehensive reference materials. To improve its telephone support, Philips is preparing a software program that will allow callers to get assistance via modem 24 hours a day. The program will be instituted by this fall.

While Philips falls somewhat short on its service ratings, its reliability scores come out roughly equal to those of moni-

solder joint or hardware incompatibility, which may have resulted in a blank screen, loss of color, or other impairment. "A connection on the circuit board was cracked," says Denzel Dyer, president of Dyer Laboratories of Torrance, California. "Fixing it was easy, but finding it was tough."

Having had their Magnavox monitors repaired—by whatever sources they used—survey respondents rate their satisfaction with the repairs more favorably than monitor users overall.

MAGNAVOX EGA MONITORS

While no single model among Philips' Magnavox monitors has enough users for us to evaluate it separately, about 17 percent of the 499 Magnavox users who responded to our survey work with one of the company's EGA displays. This group indicates a higher level of satisfaction than many other monitor users we surveyed.

Magnavox EGA monitor users report fewer problems than average: only 6 out of 87 respondents (7 percent) say that their EGA monitors have given them trouble. This compares with 17 percent of all users of EGA monitors.

While the incidence of problems is low, Philips' technical support for the EGA category earns ratings much lower than average among EGA monitor makers. Repair service, on the other hand, fares well among the small proportion who have needed it, especially when Philips did the repairs.

The Magnavox EGA owners among our respondents are loyal customers: 91 percent say they would buy from Magnavox again. By comparison, only 80 per-

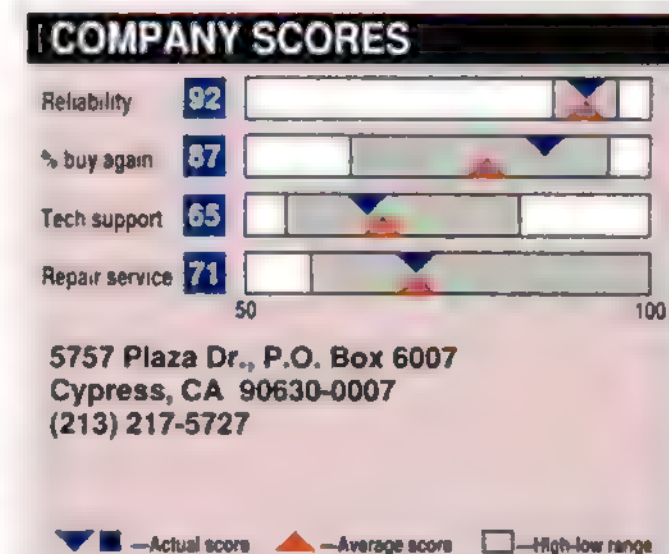
tion with repairs above average.

Like owners of Magnavox CGA and VGA monitors, these respondents have weighed the company's solid reputation and good repair record and give Philips a resounding vote of confidence.

CIRCLE 655 ON READER SERVICE CARD

Mitsubishi Inc.

by Joseph J. Antinori



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Cypress, CA 90630-0007
(213) 217-5727

Mitsubishi's Information Systems Division, the \$770 million Mitsubishi branch that deals with the manufacture and marketing of desktop and portable PCs, PC boards, and monitors, has grown into a force in the PC industry. The company began selling monitors in 1977 and since then has maintained its status as a technology and market-share leader. *PC Magazine* has selected two Mitsubishi monitors as Editor's Choices, the Mitsubishi FA3425L9 (February 14, 1989) and the Mitsubishi FA3415ATK (May 15, 1990). On the whole, the reliability of Mitsubishi's monitors rates exactly average among the monitors in our survey. On many other measures, the Mitsubishi units score a little better or a little worse than the average.

A large group of 641 Mitsubishi users have responded to our survey—enough to let us analyze our findings for three different Mitsubishi monitor product lines: Super VGA, VGA, and EGA. In addition, we have enough data for a report on an individual model, the AUM-1381A (Diamond Scan), a multiscanning monitor that scans frequencies up to the Super VGA range.

Some of the data—particularly statistics about the average number of occasions a Mitsubishi product has been impaired or unusable in the past year—indicates that Mitsubishi monitors have a higher-than-average lemon inci-

Respondents have weighed the company's solid reputation and good repair record and give Philips a resounding vote of confidence.

tor manufacturers overall. Respondents rate the problems as more severe than the overall average, however.

Magnavox monitors have a problem incidence equal to the average for monitors from all companies. Although no single problem dominates, some respondents identify troubles such as a broken

cent of all EGA monitor owners say they would buy new monitors from the same manufacturer in the future. A third of the Magnavox respondents who did discover problems, including blurry or flickering images or broken parts, rate them as minor. Those who turned to the manufacturer or to their retailer for help rate their satisfac-

SERVICE AND RELIABILITY MONITORS

dence; that is, if an individual unit has had problems, the problems were more likely to recur and eventually to compel the user to replace the monitor. On the flip side, a higher-than-average percentage of these products never had a problem, and a higher-than-average 87 percent of the respondents would trust Mitsubishi with their money again.

Mitsubishi's service and technical-support policies do not vary with respect to product types. A one-year parts-and-labor warranty comes standard on all Mitsubishi monitors. Repairs are done at Mitsubishi's plant in California, as well as at TRW locations across the country and other authorized service centers. Mitsubishi also offers on-site service through TRW for an additional cost. If the user needs to send a damaged unit in for repair, that person has to pay shipping one way while Mitsubishi pays to send it back.

Only 30 percent of the respondents say they are aware that Mitsubishi operates a toll-free number for technical support, while only 8 percent have actually used the number. Both of these figures are only a few points below average. Among the 54 users who have called the number, the overall reaction is positive. More than half give the tech-support hot line the highest rating possible.

Repair service appears to be a different story. A large percentage of the respondents who have needed repairs received service directly from Mitsubishi, and among that group, a slightly less-than-average percent say they were "very satisfied" with the service. The next largest blocks of users received service from third-party service providers such as TRW or at retail locations. An extremely low percentage feels that the third parties' service is worthy of the highest rating. Retail outlets fare better, with 46 percent reporting a high level of satisfaction.

The average satisfaction ratings for repairs performed by the manufacturer and by the retail service centers are only a short distance below the overall average. Third-party providers emerge far below the average. Note that respondents have been able to remedy many impairments themselves, without recourse to a service professional.

In response to findings about third-party service providers, a Mitsubishi spokesman says, "Mitsubishi performs the largest portion of repairs to its monitor products. TRW is our largest authorized service provider to the end-user level of

our products, and their performance is monitored. TRW is committed to improving customer satisfaction. Changes made by TRW earlier this year to improve performance are evident to Mitsubishi and should by now be visible to end users."

MITSUBISHI SUPER VGA MONITORS

A large number of Mitsubishi respondents (114) use monitors capable of Super VGA resolution. Mitsubishi Super VGA respondents feel slightly more positive about their machines; their units score 91 for overall reliability, which is nearly as high as the average.

Our findings indicate mixed opinions about Mitsubishi's Super VGA product line. Only 12 percent of the users have ever experienced a problem, and the severity of these problems goes only slightly higher than the average for Super VGA displays. A higher proportion than average say their monitors have worked properly throughout the past year.

These results seem to indicate general satisfaction with Mitsubishi's Super

VGAs. But among the users who report ever having had a problem, the percentage whose units have been impaired or unusable in the past year rises slightly above the average for Super VGA monitors from all manufacturers. Among these respondents, the monitors have been unusable an average of three times, compared with two for Super VGA users overall.

Nevertheless, 86 percent of Mitsubishi Super VGA users would buy from Mitsubishi again, and 96 percent say that their current Super VGA units meet their needs.

MITSUBISHI AUM-1381A

(DIAMOND SCAN 14)

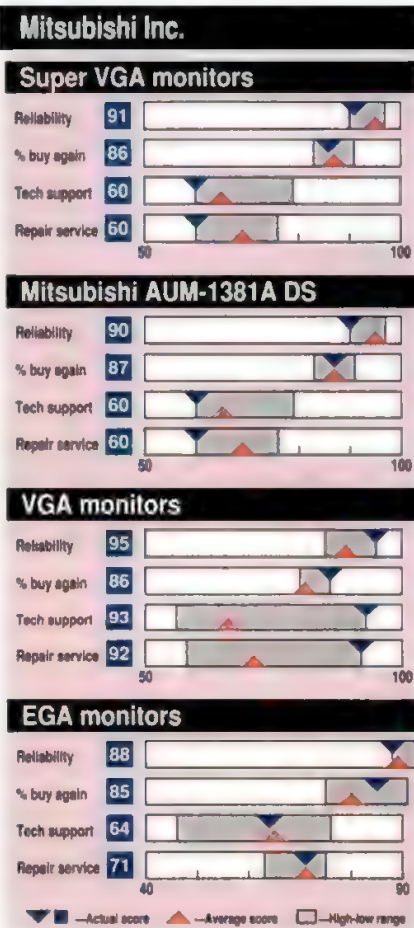
Offering a wide range of options, including the ability to display composite video (VCR) signals and to display two different types of signals on-screen at once, the multiscanning AUM-1381A is one of the most sophisticated monitors on the market today. This Japanese-made unit can recognize and display every IBM-standard video signal except 8514/A.

Unfortunately, users find the machine prone to defects. They give it an average reliability rating of 90, somewhat less than the 95 average found in Super VGA monitors and multiscanning monitors overall. And among the 13 percent of the respondents who have experienced problems with the Mitsubishi AUM-1381A, 77 percent indicate that their units have been impaired or unusable at some time in the past 12 months. And the typical problem is more serious than it would be for the Super VGA monitor group or for multiscanning monitors overall.

On the other hand, a slightly higher-than-average proportion of respondents say their units worked properly for all of the past year. Perhaps the problem monitors consist of a relatively small percentage of lemons.

A spokesman for Mitsubishi says, "All products returned to Mitsubishi are inspected by our independent Quality Control Department prior to being returned to customers. Quality tests are made to ensure that repairs meet or exceed original product specifications. This unfortunately does not always allow for the various applications and configurations in which our products can be used. In all areas, however, we do work with customers to resolve even system-level problems."

Still, experiences like those reported by Don Taylor, a software engineer at PC Services in Newport News, Virginia, appear to have been too common. "My



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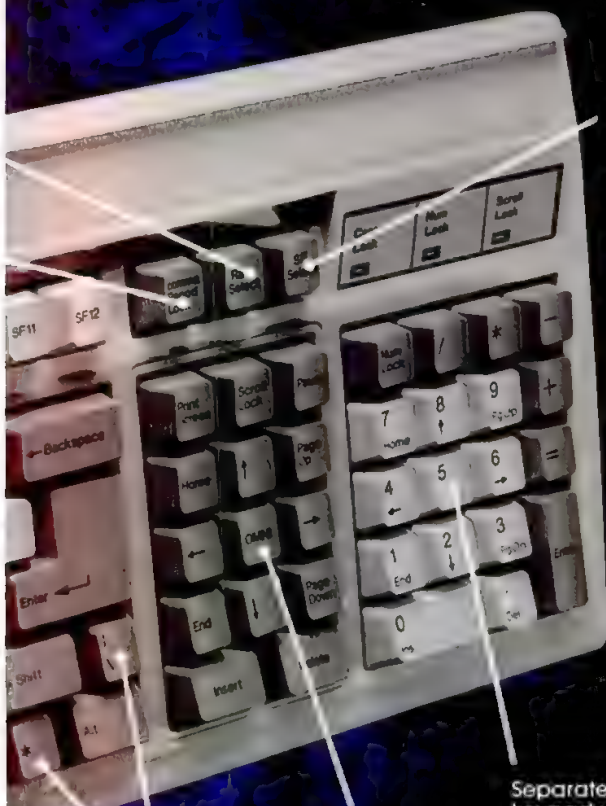
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AUM-1381A monitor was problematic throughout the first year, then just died after about a year and a half—after the warranty had expired,” he says.

Regardless of such cases, 87 percent of the AUM-1381A users say they would buy from Mitsubishi again. Perhaps their attitude can be explained by the advanced technology the product offers. Fully 96 percent say that the AUM-1381A meets their needs, and out of this base, the large majority predict that it will continue to do so, for an average of 35 months to come.

MITSUBISHI VGA MONITORS

Users of Mitsubishi's VGA units rate their products favorably. Survey respondents give Mitsubishi VGAs an average reliability rating of 95, compared with 89 for all VGA monitors. 6 percent less than the

it receives for overall reliability, which is slightly less than the average for all EGA models. Partially, but not completely. Mitsubishi EGA models score worse than the same company's VGA, Super VGA, and overall monitors in many categories. This seems to suggest that users are not just tired of the old screens—they're unhappy.

83 percent of the responding users have experienced problems with their monitors in the past year. What is even worse, those units that did have problems were impaired an average of ten times during that year—twice the average number for EGA systems.

Bill Humphrey, owner of Acorn Technical Services in Denver, Colorado, suf-

“I’ve never had to do anything but press the button to turn on my Mitsubishi VGA monitor. The picture is excellent; it’s more than serviceable for my needs.”

19 percent average for all VGA users have ever had a problem with their units, and 6 percent more than the 4 percent average report that their monitors have functioned properly for the past year.

Praise for the Mitsubishi VGA units is fairly general from the users responding to our survey. Bill Farris, owner of Career Management Services in Lonemont, Colorado, has never experienced any difficulties with his unit. “It’s got great color and a wide range of tuning options,” he says. His sentiments are echoed by Clinton Lemon, president of George A. Rheman Co., a trucking company in Barnwell, South Carolina. “I’ve never had to do anything but press the button to turn it on,” Lemon says. “The picture is excellent; it’s more than serviceable for my needs.”

Not surprisingly, 86 percent of the users in this category would buy again from Mitsubishi eventually, even though more than a third of them feel that their current units will continue to meet their needs for two years or more.

MITSUBISHI EGA MONITORS

The typical Mitsubishi EGA monitor has been in use three months longer than the average EGA monitor in our survey. That may partially account for the rating of 88

fered problems with his Mitsubishi EGA unit in February of 1989. He writes: “I had two separate Mitsubishi EGA monitors fail after only a few weeks of service. They were both replaced under warranty, but the second time, the mail-order company replaced the Mitsubishi with a different brand instead. I haven’t had any trouble since.”

A spokesman for Mitsubishi responds to our findings: “Your assessment of the EGA models and technology is unclear.

Nanao wins the allegiance of the highest percentage of users who say they would buy again from the same company.

Mitsubishi has been among the leaders in development of quality display monitors and the EGA line is one of our larger customer-based products.”

More than half of the Mitsubishi EGA respondents plan an upgrade within the next two years. Meanwhile, 85 percent say they that would buy from Mitsubishi again. Maybe they know somebody with one of the VGA models.

CIRCLE 656 ON READER SERVICE CARD

Nanao USA Corp.

Michael Cohn

COMPANY SCORES



23510 Telo Ave., #5
Torrance, CA 90505
(213) 325-5202

▼ Actual score ▲ Average score □ High-low range

Nanao sometimes produces monitors that are a few years ahead of their time. When *PC Magazine* reviewed the Nanao 8060S (May 16, 1989), this was our verdict: “A rather dated monitor, Nanao USA Corp.’s 8060S is so well made that it remains competitive. Though two years old, the display features one of the most tightly converged images found in the monitors reviewed in this issue.”

The same reliability has shown up in force in our survey results. Nanao, tied with NEC Technologies, garners the highest reliability rating among monitor manufacturers in our survey. It also wins the allegiance of the highest percentage of users who say they would buy again from the same company. It emerges in second place in terms of respondents’ satisfaction with the manufacturer’s tech support. And best of all, for repair service, it scores a solid 100 in user satisfaction ratings.

Nanao USA Corp. is actually the American marketing arm of Nanao Corp.,

a Japanese manufacturer that also produces graphics boards. The American subsidiary has been around since 1985. Since its appearance, it has moved aggressively into the area of big-screen monitors and become a notable contender for desktop publishers looking for the perfect display.

Apparently, desktop publishers will find a lot of reliability in a Nanao monitor. Its 96 reliability rating is well above the 92

SERVICE AND RELIABILITY MONITORS

average for monitors overall. You can't really go much higher, and no monitor company in our survey has. 87 percent of the Nanao respondents gave the company the highest reliability rating possible.

Moreover, Nanao can boast of a lower-than-average incidence of problems; 5 percent of our 85 Nanao respondents' monitors have given them some trouble. That should be compared with the 14 percent problem incidence for monitors overall.

LITTLE SUPPORT NEEDED

Among those monitor respondents who have experienced problems, Nanao monitors attract far better-than-average satisfaction ratings for technical support, regardless of the source. (No Nanao monitor respondents seem to have turned to direct marketers for support.) As mentioned earlier, the overall tech-support satisfaction rating is the second-highest among the companies found in our monitor survey, 81. This, however, is based on only seven respondents—those who needed to ask for tech support for their Nanao monitors.

Similarly, among the six respondents who have needed repair service for their Nanao monitors, their satisfaction with repairs (from any source) results in the highest possible marks, earning Nanao a solid 100 score.

We did notice a slightly greater-than-average proportion of the impaired or unusable monitors whose malfunctions have occurred during the past year: 75 percent, compared with 69 percent over-

19 percent, compared with 32 percent of monitor respondents overall. The six Nanao respondents who have actually used the hot line express varying degrees of satisfaction with it, from top to middling.

Nanao's hot line is not a toll-free number, but users can call it between 11:30 and 8:00 Eastern Standard Time, even if the standard one-year parts-and-labor warranty has already expired. If they need to send in a product for servicing under warranty, repairs can be performed at Nanao's plant, or at service outlets, or by authorized dealers. No on-site service is currently available.

Robert E. Simanski, director of communications in the Building Service Contractors Association International, in Fairfax, Virginia, says, "The Nanao 9070U is a superb monitor. It's well suited for my primary purpose, desktop publishing. But I also run a lot of other programs, like my word processor and spreadsheet. I looked at portrait and two-page monitors, which are fine for what they're designed for. But for ordinary work, the thought of looking at a white-on-black screen all the time would be too boring. My salesperson didn't normally carry Nanao. Since I ordered the monitor from him, he's stocking it and says it blows everything away."

A spokesman for Nanao replies: "Customer satisfaction requires built-in quality and strong technical support. Users recognize Nanao's strong commitment. We plan to underline further this obliga-

overall). Nanao appears to have built a remarkably loyal customer base for itself, surpassing the monitor competition in many areas.

CIRCLE 657 ON READER SERVICE CARD

NEC Technologies Inc.

by Christopher Barr

COMPANY SCORES



1414 Massachusetts Ave.
Boxborough, MA 01719
(508) 264-4300
(800) 632-4636 (sales)
(800) 366-3632 (technical support)

Actual score Average score High-low range

NEC Technologies, formerly NEC Home Electronics, seized a considerable share of the monitor market when it introduced the multiscanning MultiSync in late 1985 (the NEC JC-1401P3A MultiSync was a *PC Magazine* Editor's Choice, March 25, 1986). NEC replaced the original with the MultiSync II (Editor's Choice, May 31, 1988) to zero in on the VGA market. Today the MultiSync and MultiSync II have been replaced by the VGA-only MultiSync 2A and the multiscanning MultiSync 3D (both reviewed in the issue of May 15, 1990, where the 3D was an Editor's Choice).

In our survey, a significant number of respondents are still very happy using the original MultiSync or MultiSync II and report only a small number of problems. When compared as a group against all monitors, the NEC monitors emerge as slightly more reliable (96 versus 92 percent) and have fewer problems (10 versus 14 percent).

As a whole, NEC monitor users are very pleased with what they see. More than 91 percent of the NEC monitor users would buy from NEC again, as opposed to only 80 percent of all monitor users. But not all NEC monitors fared equally. Our results indicate that users of the MultiSync 2A are not as satisfied as users of most other NEC monitors, although they indicate a higher level of satisfaction than monitor users overall.

The data shows that Nanao appears to have built a remarkably loyal customer base for itself, surpassing the monitor competition in many areas.

all. Yet this figure is hardly worth mentioning, since these problems occurred only once for each of the four respondents who mention them. Two of them rate the problems as very serious, the other two as minor.

Perhaps because so few monitor respondents have required either technical support or repairs, a lower-than-average proportion of Nanao users say they are aware of Nanao's tech-support hot line:

tion in fall 1990, when Nanao will offer nationwide service and an 800 number."

Based on our survey, Nanao has satisfied its customers thoroughly. 96 percent of the Nanao monitor respondents find that their monitors currently meet their needs, compared with 84 percent of all monitor users. If they needed to buy another monitor, 95 percent say they would buy from the same manufacturer again (the score is 80 percent for monitor users

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SERVICE AND CONSUMER EXPECTATIONS

Only 8 percent of the MultiSync 3D users reported a problem. This number falls below the average of 14 percent for all monitors, and it indicates that the 3D is a reliable product. A comment by Timothy Hunt, President of CAD Inifinitum in New York, typifies the experience of the few who reported problems: "I called the 800 number and they referred me to a service center, which was another computer dealer. In two days I had a new monitor."

NEC Technologies Inc.

NEC MultiSync 3D



NEC MultiSync 2A



NEC MultiSync JC1401P3A



NEC MultiSync II/II Plus



NEC MultiSync 5D



NEC MultiSync GS2A/GE



SERVICE AND RELIABILITY MONITORS

Asked whether he would buy from NEC again, Hunt, along with a whopping 92 percent of fellow 3D users, replied with a resounding yes.

If MultiSync 2A users are less satisfied than users of the 3D and the first two MultiSync monitors, this seems to be a perception problem. 2A users report only slightly more problems than 3D users (10 percent versus 8 percent), but when asked whether the 2A has lived up to their original expectations, only 84 percent come back with yes, while 91 percent of the 3D users respond positively. And this is one of the few instances where NEC compares unfavorably with all other monitors. Bob Anderson of Seattle says, "I had a MultiSync prior to the 2A, but I won't buy a NEC monitor again."

NEC warrants its monitors for two years on parts and one year on labor. Warranty work is provided at an authorized service center, which you can locate by calling (800) 366-3632. Anderson and other NEC owners had problems with the service. For instance, in many cases the service centers would hold the monitor for weeks, making the system totally unusable while the monitor was out. Says Guy Phillips, an area sales representative for Pitney Bowes in Texas: "My 2A was purchased from a dealer who was not authorized to service, only to sell. After contacting NEC by its 1-800 hot line I was referred to another retailer. Each time I called to check, I got a different version of the problem. After six weeks it was replaced with a new unit."

In response to our findings, a NEC spokesman assures us that service has been improved. NEC has reorganized its technical support department and instituted a new monitor repair program. Over the past year NEC has reauthorized its resellers and made recommendations for the service centers to stock more parts so they can make repairs to monitors more rapidly. If a monitor needs to be replaced, NEC says it will swap it for a rebuilt model.

That will be good news to MultiSync 2A owners like Dr. Rory Jaffe in Davis, California, who sent his monitor in twice for repair. The second time, the service center estimated that the work would take approximately three weeks or more. Says Jaffe, "Without a monitor, a computer is unusable."

CIRCLE 658 ON READER SERVICE CARD

Packard Bell

Christina Dyar

COMPANY SCORES



9425 Canoga Ave.
Chatsworth, CA 91311
(818) 773-4400
(800) 733-4411 (technical support)

Packard-Bell started as a radio manufacturer in the late 1920s. It went through a number of changes and emerged in the late '80s as number 7 among the companies shipping IBM-compatible computers, thanks mostly to its aggressively priced line of 8088-based PCs. Packard Bell monitors generally earn high scores in our surveys, but those scores happen to fall squarely in the middle of the pack among monitor users overall.

For example, a Packard Bell monitor has a level of reliability about as high as you can expect from most monitor companies. The percentage of problem units and of monitors that worked properly all through the past year, the average number of occasions each unit was impaired or rendered unusable, and the average severity of a typical problem all emerge competitive with the scores of other monitor manufacturers, without performing significantly better or worse than the competition.

Predictably, out of the 543 users of Packard Bell monitors who wrote to us, the largest number of survey respondents who ever needed technical support have turned directly to Packard Bell, followed in turn by those who enlisted the aid of the retailer, a direct marketer, a third party (such as an on-site service organization), or an in-house department within their own companies. Again, the respondents' level of satisfaction comes out solid, yet similar to the score for monitor manufacturers overall (with a slightly greater portion of users aware that Packard Bell offers its own tech-support hot line). The company's toll-free number can handle up to 700 calls a day. Complex technical questions are routed to product specialists, while relatively routine questions are handled by a specific team.

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MONITORS

Packard Bell

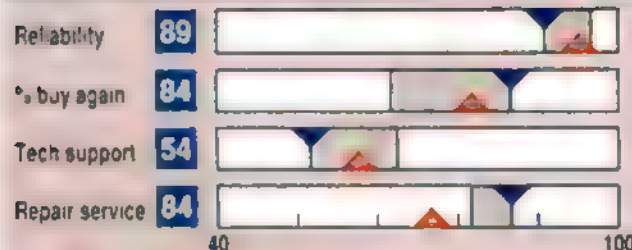
VGA monitors



EGA monitors



Monochrome monitors



▼ —Actual score ▲ —Average score □ —High-low range

In the area of repair service, respondents report a higher level of satisfaction with Packard Bell monitors than with monitors overall. This is true for almost every source of repair. Packard Bell itself, the most frequent choice for performing repairs, scores well above the average for all companies' monitors. Last fall, the firm improved its service and support offerings, introducing a new policy that provides on-site service by AT&T Paradyne for the first four months of the year-long warranty (the remaining eight months cover carry-in service).

Not entirely evident in the scores we calculated from the survey, but worthy of mention because of their unusually high proportion, are the number of write-in comments that sharply criticize Packard Bell's repair service delays and the voice mail system on its tech support line. James M. Hunter, a computer technician from Irving, Texas, tells us: "I like Packard Bell's products a lot, but I believe the company has one of the worst tech-support lines available. The whole thing is on a voice mail system, which at first seems like a great idea but involves 20 to 30 minutes on the phone just to get to a point where the system will finally put you through to an operator, who then takes your name and number and tells you they will call you back in 48 to 72 hours. I ended up waiting a whole two weeks just for a call back and an RMA [return mate-

rial authorization] number."

Packard Bell says it feels its problem, particularly with the phone system, is solved. "We were overloaded last December and January, and the end user was not receiving the support he wanted, but we analyzed the problem, and we've upgraded the system and doubled the on-line staff by March. Furthermore, we expect to increase the on-line staff by 30 or 40 percent by August in anticipation of this fall."

PACKARD BELL VGA MONITORS

Packard Bell's VGA users responding to our survey give the firm a healthy reliability rating, citing a significantly lower percentage of overall problems than monitor users in general report. Michael Baer, a student in San Jose, California, says, "My monitor has been almost perfect. I have had no problems with it, and it's been a very good monitor, especially at such a low price."

Overall, VGA respondents are very satisfied with the technical support they have received for their Packard Bell monitors, both from Packard Bell and from other sources. One reason may be that a relatively large proportion of Packard Bell VGA users, 17 percent, are aware that a technical hot line exists. Yet it's among these VGA respondents (18 of them) who are aware of the hot line that we find some of the negative write-in comments described above.

The same general satisfaction with technical support also holds true for repair

monitor is very good and I'm very happy with it. I was looking at another monitor at the time I bought it and found out from a friend who had the other one that he had many problems with his. This made my decision on the Packard Bell even easier."

Ratings for satisfaction with technical support and with Packard Bell's own repair service are competitive with the results for other EGA display manufacturers. Overall, problem incidence comes out slightly lower for Packard Bell EGA displays.

PACKARD BELL MONOCHROME MONITORS

Among users of Packard Bell monochrome monitors who have responded to our survey, the overall reliability, problem incidence, and level of satisfaction with the company's tech support roughly correspond to the results for other manufacturers. But a greater proportion of Packard Bell respondents report that their mono monitors have been impaired or unusable during a portion of the past year. Nevertheless, mono users rate Packard Bell's repair service higher than the survey average for monitor manufacturers overall.

One Packard Bell monochrome user, Douglas Durand, a professor at the University of South Carolina, found that the image on his screen was misaligned. He sent it back to Packard Bell. "They repaired it and aligned the image," he says. "They even called a few days later to make sure I was satisfied. I was very impressed that they followed up."

Packard Bell's VGA users responding to our survey give the firm a healthy reliability rating.

service on the company's VGA displays. Each source, including Packard Bell, receives extremely high marks.

PACKARD BELL EGA MONITORS

EGA monitor users responding to our survey trust the reliability of Packard Bell's products. Their ratings are reasonably in line with the high average for EGA monitors overall.

Bill Ingram, a firefighter in Milwaukee, Wisconsin, says, "The Packard Bell

Packard Bell says, "We're pleased that we got a good positive response. Monochrome monitors are often used in a general industrial, heavier-duty-cycle environment, so they get heavier usage." As long as Packard Bell can continue to improve its support in this way, especially on its phone line, then usage in the academic or the industrial environment shouldn't present a problem for its customers.

CIRCLE 659 ON READER SERVICE CARD



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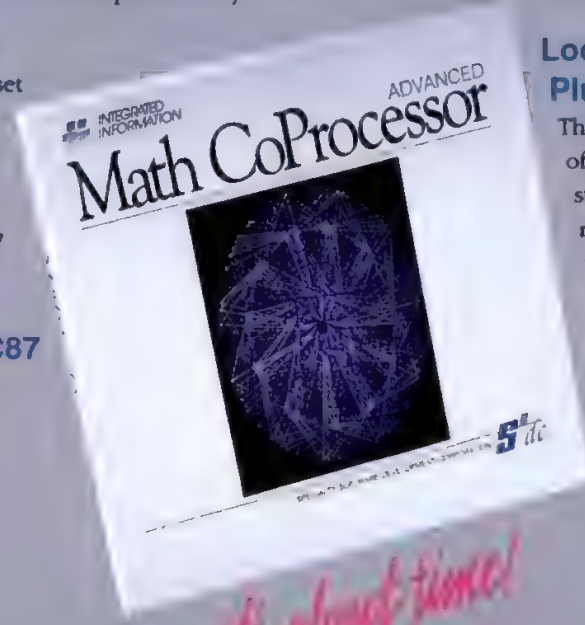
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CIRCLE 346 ON READER SERVICE CARD



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Princeton Graphic Systems

Christina Dyar

COMPANY SCORES



1100 Northmeadow Pkwy., #150
Roswell, GA 30076
(404) 664-1010
(800) 221-1490 (sales)
(800) 221-1490 (technical support)

Actual score Average score High-low range

Princeton Graphic Systems first became known for its highly popular, consistently performing CGA monitors. Its reliability score of 91—competitive with monitor manufacturers overall—comes as no sur-

SERVICE AND RELIABILITY MONITORS

prise in the light of the company's reputation. After all, Princeton Graphic Systems is a specialist; it manufactures only monitors and color graphics terminals. And an unusually large proportion of Princeton respondents are brand specifiers and thus relatively loyal to the company.

Princeton Graphic Systems passes the acid test for the *PC Magazine* Service and Reliability Survey: the majority of respondents say they would buy from this manufacturer again, and it earns a score close to the average that monitor manufacturers received overall. The proportion

of Princeton monitors that have been impaired or unusable at least once during the past year is the same as for all monitor manufacturers that respondents mention in the survey. The average severity rating of a typical problem also hits a mark similar to the score for all manufacturers combined.

In opposition to these positive ratings lurk the lackluster repair scores, both for Princeton's own service and for all sources of Princeton monitor repair (a greater portion of the respondents depend on Princeton for repair than on any other single source). Among the Princeton respondents who have experienced prob-

This table provides an initial guide to the support services that manufacturers offer directly to end users. In some cases, companies like Hewlett-Packard and Zenith Data Systems will negotiate individualized service contracts with large customers; the terms of such contracts are not listed here. Turn to the individual company listings for further details.

Companies such as Compaq and IBM, which sell their products primarily or exclusively through dealer channels, tend to

provide service and support through the same channels. When the table states that a manufacturer does not provide a particular service, there is a chance that its authorized dealers do.

Two manufacturers discussed by survey respondents, Kaypro Corp. and MiniScribe Corp., are not listed in this table. Kaypro is in the middle of reworking its support and service practices; MiniScribe is no longer actively marketing products or providing technical support.

SERVICE AND SUPPORT OPTIONS

TECH SUPPORT

Telephone tech support for end users:

Tech support without charge	☐	☒	☒	☐	☒	☒	☐	☒	☒
Toll-free number	☐	☐	☒	☐	☐	☐	☒	☒	☒
900 number (pay-per-call)	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hours when phone is attended (E.S.T.)	N/A	7:00a-5:00p	9:00a-5:00p	N/A	10:30a-7:00p	9:30a-5:30p	24 hours	7:00a-9:00p	8:45a-4:30p

Tech support via bulletin board service

Manufacturer's warranty:	☒	☒	☐	☐	☒	☒	☒	☐	☐
Parts	1 year	1 year	1 year	1 year	5 years	2 years	Varies	1 year	1 year
Labor	1 year	1 year	1 year	1 year	5 years	2 years	Varies	1 year	1 year

REPAIR SERVICE

Manufacturer offers repair service at its own plant	☒	☒	☐	☐	☒	☒	☒	☒	☐
Pays shipping charges to/from plant	☒	☒	N/A	N/A	☐	☐	☐	☒	N/A
Ships unit back by the same method customer used	☐	☒	N/A	N/A	☒	☐	☐	☒	N/A
Offers overnight shipping option	☒	☐	N/A	N/A	☒	☒	☒	☒	N/A
Ships replacement item out before receiving damaged item	☒	☒	N/A	N/A	☒	☐	☒	☒	N/A
Manufacturer offers service through authorized dealers	☒	☒	☒	☒	☒	☐	☒	☒	☒
Authorized dealers must stock replacement parts	☒	☒	☒	☒	☒	N/A	☒	☒	☐
Manufacturer has dealer certification program	☒	☒	☒	☒	☒	N/A	☒	☐	☒
Manufacturer has dealer training program	☒	☒	☒	☒	☒	N/A	☒	☒	☒
Manufacturer offers service through service outlets	☒	☒	☒	☐	☒	☐	☒	☐	☒
Manufacturer offers on-site service option	☒	☒	☐	☒	☒	☐	☒	☒	☐
Service provider	Various	Intel	N/A	Various	AST	N/A	AT&T, others	General Electric	N/A

☒—Yes ☐—No

N/A—Not applicable: the manufacturer does not offer any service in this category.

SERVICE AND RELIABILITY MONITORS

lems with their monitors, a greater-than-average percentage say they were not at all satisfied with Princeton's repair service. The third-party repair source—Bell Atlantic Business Systems Services, formerly known as Sorbus—and in-house departments also receive grim, below-average satisfaction ratings.

One user who gave Princeton a low repair service rating is Eugene Servillo II, a senior analyst with the Centel Corp. Computing Support Center in Chicago, Illinois. Finding he wasn't able to switch modes on his Princeton Max 12E monochrome display, he sent it back for repair twice, without success. He eventually turned up the cause on his own, as he relates: "It turned out it was just the cable. It was wrong. I happened to ask them on the phone how many pins were supposed to be in the connector on the plug. I found out the cable had one pin missing. The final phone call established it. Once they fixed it, the monitor was incredibly satisfactory. It worked great up until last month,

but age and use eventually did it in. It was a reliable piece of equipment, though I wish I'd bought color."

Luckily for those Princeton monitor users who have experienced problems, a greater-than-average proportion were covered at the time by the manufacturer's warranty: two years on parts and one year labor. If a unit needs repair under warranty, the customer pays for shipping to the Princeton plant and Princeton takes care of the rest. On-site service is an option available through Bell Atlantic.

In our survey, Princeton's technical support fares better than its repair service; it is competitive with the overall average for monitor manufacturers. As with repair service, Princeton itself functions as the most frequent source of support among Princeton respondents.

One means of support is Princeton's toll-free tech-support hot line. An above-average percentage of Princeton users are

Princeton Graphics Systems

Super VGA monitors



Princeton Ultra 14/Ultasync 14



aware of their monitor maker's hot line. Among those who have used the line, a significantly greater-than-average proportion say they felt very satisfied with it.

PRINCETON GRAPHIC SYSTEMS SUPER VGA MONITORS

Princeton Graphic Systems manufactures a series of Super VGA monitors that overall earn a reliability score consistent with the ratings for Super VGA displays from all manufacturers. The incidence of problems comes to 17 percent, higher by 5 points than the average for Super VGA monitors overall. Out of this group of problem monitors, a greater-than-average portion of the Princeton Super VGA users report that their monitors have been impaired or unusable sometime within the past year.

A greater-than-average percentage of the Princeton Super VGA users have tried the manufacturer's 800-number support line. In this group, a greater-than-average percentage pronounce themselves "very satisfied" with the technical service they received.

The two Princeton Super VGA displays that respondents identify in their surveys fit into the category of multiscanning monitors. The Ultra-12 (also known as the Ultasync 12) scans as high as Super VGA resolution (800 by 600 pixels), but it can also work with VGA, EGA, CGA, and mono adapters; the same is true of the Ultra-14/Ultasync 14, profiled below. Also in the multiscanning category are the Princeton monitors that can scan as high as 1,024 by 768 resolution, including the Ultra II/Ultasync II and the Ultra-16/Ultasync 16.

Again the survey results demonstrate that Princeton satisfies users, boasting a reliability rating of 91, nearly as high as

Canon USA Inc.	Citizen America Corp.	C. Itoh Electronics Co.	Commodore Business Machines	Compaq Computer Corp.	CompuAdd Corp.	Conner Peripherals Inc.	Datavue Corp.
■	■	■	□	□	■	■	■
■	□	■	□	□	■	□	□
□	□	□	□	□	■	□	□
9:00a-7:00p	11:00a-7:30p	9:00a-5:00p	N/A	N/A	9:00a-6:00p	11:00a-8:00p	8:00a-5:00p
■	■	□	□	□	□	□	□
1 year	2 years	1 year	1 year	1 year	1 year	1 year	1 year
1 year	2 years	1 year	1 year	1 year	1 year	1 year	1 year
■	□	■	□	□	■	■	■
□ / ■	N/A	□ / ■	N/A	N/A	■ / ■	□ / ■	□ / ■
□	N/A	■	N/A	N/A	■	■	■
□	N/A	■	N/A	N/A	■	□	□
■	■	■	■	■	■	□	□
■	□	■	■	■	■	N/A	N/A
■	■	■	■	■	□	N/A	N/A
■	□	■	■	■	■	N/A	N/A
■	■	■	■	□	■	□	□
■	■	■	□	□	■	■	□
Bell Atlantic, Bell Atlantic others	Various	Various	N/A	N/A	Memorex Telex	Conner Peripherals	N/A

CONTINUES

MONITORS

the 95 rating for multiscanning monitors overall. The Princeton multiscanning group shows a greater incidence of problems than the average multiscanning display, however, and the average severity of these problems also exceeds the overall average. Again, the repair service scores are disappointing, particularly for users who turn to Princeton for repairs.

buy from the same vendor again.

Alex Howard, a computer consultant with Oxyoron Unlimited in North Bergen, New Jersey, has had his share of problems with the Ultrasync 12: "About four months after I got the monitor, I noticed that every time I turned it on, the

"Now I'm about to get a return authorization for the replacement! This one produces a high oscillating noise. The only way to prevent it is not to turn it off. So far, I've had two problems in the year since I bought the monitor. All the systems I've installed for clients never had a problem."

Princeton remains confident in the face of such negative reactions. "Over the last six months," it says, "we have focused our emphasis on quality assurance, parts sourcing, and increased repair efficiency."

The Princeton multiscanning group shows a greater incidence of problems than the average multiscanning display.

Survey respondents are pleased with tech support, whether provided by Princeton or by other sources, in comparison with the level of satisfaction reported by multiscanning monitor users overall. In spite of this frustration with repairs, most Princeton multiscan users say they would

image on the screen was displaced. The image would be either too high, too low, or a little warped. It just wouldn't hold its configuration after you set all the knobs that should have set it permanently. I eventually got a replacement from Princeton.

PRINCETON GRAPHIC SYSTEMS ULTRA-14

The Ultra-14 is known as the Ultrasync 14 when bundled with some direct marketers' systems, such as Dell's. It belongs to a family of Princeton monitors, all of which can scan up to Super VGA range or higher; some of them go as far as 1,024 by 768 resolution. Most models in this group, like the Ultra-14, also belong in the multiscanning monitor class. Two of Prince-



SERVICE AND SUPPORT OPTIONS

	Dell Computer Corp.	DTK Computer Inc.	Epson America Inc.	Everex Systems Inc.	Fujitsu America Inc.	Gateway 2000	Genoa Systems Corp.	GoldStar Technology Inc.	GRID Systems Corp.
TECH SUPPORT									
Telephone tech support for end users:									
Tech support without charge	■	■ (1 year)	□	■	■	■	■	■	■ (1 year)
Toll-free number	□	□	□	□	■	■	□	■	■
900 number (pay-per-call)	□	□	□	□	□	□	□	□	□
Hours when phone is attended (E.S.T.)	6:00a-6:00p	8:30a-8:30p	10:00a-7:00p	9:00a-8:00p	8:00a-8:00p	9:00a-11:00p	9:00a-12:00 noon, 1:00p-4:00p	11:00a-8:00p	9:00a-8:00p
Tech support via bulletin board service	■	■	■	■	□	■	■	□	□
Manufacturer's warranty:									
Parts	1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year (CRT 3 years)	1 year
Labor	1 year	1 year	1 year	1 year	1 year	Unlimited	1 year	1 year	1 year
REPAIR SERVICE									
Manufacturer offers repair service at its own plant	■	■	□	■	■	■	■	□	■
Pays shipping charges to/from plant	□ / □	□ / ■	N/A	□ / ■	□ / ■	□ / ■	□ / ■	□ / ■	□ / ■
Ships unit back by the same method customer used	□	■	N/A	□	■	■	□	□	■
Offers overnight shipping option	■	■	N/A	□	■	■	■	■	■
Ships replacement item out before receiving damaged item	■	□	N/A	■	□	■	□	□	■
Manufacturer offers service through authorized dealers	□	■	■	■	■	□	□	□	□
Authorized dealers must stock replacement parts	N/A	■	■	■	■	N/A	N/A	N/A	N/A
Manufacturer has dealer certification program	N/A	□	■	■	■	N/A	N/A	N/A	N/A
Manufacturer has dealer training program	N/A	□	■	■	■	N/A	N/A	N/A	N/A
Manufacturer offers service through service outlets	□	□	■	■	■	□	□	■	□
Manufacturer offers on-site service option	■ (1 year free)	■	□	■	■	■	□	■ (for PCs only)	□
Service provider	Xerox	DTK	N/A	NCS	Fujitsu	TRW	N/A	Dannison Data	N/A

■—Yes □—No

N/A—Not applicable: the manufacturer does not offer any service in this category.



MONITORS

ton's Ultra line of monitors have been selected as *PC Magazine* Editor's Choices (the Princeton Ultrasync 12, May 31, 1988, and the Ultra-16, February 14, 1989).

The Ultra-14 receives a 92 reliability rating from our respondents, which is reasonably in line with the overall averages for both Super VGA and multiscanning monitors. 17 percent of the Ultra-14 users note having had problems; this is slightly greater than the overall problem incidence for Super VGA and multiscanning displays. Among these problem monitors, however, a greater proportion of respondents' Ultra-14s have been impaired or unusable in the last 12 months than is usual for monitors of these types.

We have already noted a greater-than-average proportion of recent problems for Princeton's Super VGA line of monitors, and to a lesser extent it can be seen in the ratings for Princeton monitors overall. But the Ultra-14 scores have an influence on the overall Princeton results. The Ultra-14 receives 249 survey responses,

while—if we include that model—the entire Princeton Super VGA product line gets only 295 responses; the Princeton family of multiscanning monitors, 424 responses; and the whole catalog of Princeton monitors, 794 responses. The Ultra-

for repair service as well. A greater-than-average proportion of respondents give one of the two highest satisfaction ratings for Ultra-14 repairs to the service providers they have used.

One reason for such satisfaction may be the significantly shorter average length of usage for the Ultra-14: 8 months,

Of the 44 Ultra-14 users who have called Princeton's tech-support hot line, a majority say they are very satisfied with the help they received from it.

14 seems to dominate at least the Princeton Super VGA scores.

Satisfaction with technical support for the Ultra-14 is greater than for Super VGA and for multiscanning monitors overall. To some extent, this can be seen

compared with 18 months of usage for the average Super VGA monitor (18 months also happens to be the average length of usage for multiscanning monitors). The shorter the time any piece of equipment has been in use, the less likelihood there is of problems having developed.

Compared with Super VGA users and multiscanning users overall, a greater proportion of Ultra-14 users are aware of Princeton's tech-support hot line. Of the 44 users who called the hot line, a majority say they are very satisfied with the help they received from it—significantly more than for Super VGA or multiscanning monitor respondents in general.

One user who received good support from Princeton when his Ultra-14 developed a problem is Michael Broomfield, president of Broomfield Associates, a financial consulting firm in New York City. He had obtained his Ultra-14 as part of a 286 system he purchased from Northgate. "I had two different problems with the monitor," he explains. "The tops of letters on the screen would bend to the right. Princeton said that was a bug, and they swapped the monitor for me. The service people were polite and friendly. I later had a different problem with the second monitor, with the color being off in one section. I dealt with tech support at Northgate that time. They're also nice. They say they'll call back, and they do."

All in all, 84 percent of the Ultra-14 respondents say they would buy from Princeton Graphic Systems again. That figure is roughly in line with the percentage of repeat buyers we find for Super VGA and a bit lower than average for multiscanning units from all companies.

CIRCLE 660 ON READER SERVICE CARD

Headland Technology Inc.	Hercules	Hewlett-Packard Co.	Hyundai Electronics	IBM Corp.	Leading Edge Inc.	Magnavox	Maxtor Corp.
■	■	□	■ (18 months)	□	□	■	■
■	□	■	■	□	□	□	□
□	□	□	□	□	■	□	□
11:00a-8:00p	11:30a-8:00p	24 hours	8:00a-12:00 midnight	N/A	9:00a-8:30p	8:00a-7:00p	9:30a-11:00p
■	■	□	■	□	■	□	□
7 years	2 years	1 year	18 months	1 year	20 months	1 year	1 year
7 years	2 years	1 year	18 months	1 year	20 months	1 year	1 year
■	■	■	■	□	■	□	■
□ / ■	□ / ■	□ / ■	□ / ■	N/A	□ / ■	N/A	□ / ■
□	□	■	■	N/A	■	N/A	□
■	□	■	■	N/A	■	N/A	□
□	□	□	■	N/A	■	N/A	■
□	□	■	■	■	■	■	■
N/A	N/A	□	□	■	□	■	□
N/A	N/A	■	■	■	■	□	□
N/A	N/A	■	■	■	■	□	□
□	□	■	□	■	■	■	□
□	□	■	■	■	■	□	■
N/A	N/A	Hewlett-Packard	Interlogic Trace	IBM	General Electric	N/A	Maxtor

CONTINUES

Relisys

by Susan G. Thomas

COMPANY SCORES



320 S. Milpitas Blvd.
Milpitas, CA 95035
(408) 945-9000

Actual score Average score High-low range

In a market era when VGA monitors have become fairly common and reasonably priced commodities, how can a vendor establish itself as a competitive player? Relisys has a sound solution. As a repre-

sentative explains, "You offer more: quality monitors, good prices, and outstanding service." According to our survey, Relisys delivers just that. Stable on reliability and customer loyalty, Relisys monitors score a significant 17 points above average in terms of satisfaction with all sources of technical support, and 9 points above average for repair service.

Our survey responses reflect almost unbeatable performance by the technical support department at Relisys. At most of the places where survey respondents have turned looking for technical support for their Relisys monitors—the manufacturer, a retailer, or an in-house department—they got the help they needed, and they seem highly satisfied with the results. Five survey respondents used Relisys's technical support department, and all of them

give it the highest possible rating. Six respondents consulted their retailers, and four of them give retailers the highest satisfaction rating, while another gives it the next highest. One respondent went to an in-house department for support and gives it the highest rating.

Out of the 121 respondents who use Relisys monitors, only 15 report ever having had even one problem with those monitors. Sergeant John Davis, who is stationed in Colorado Springs, Colorado, is a case in point. Davis has owned his Relisys monitor for a year and hasn't had reason to complain about its performance yet. "The price was reasonable, it displays with no problem, and the text is very legible, very sharp," he says. "Even though my monitor is only designed to display 800 by 600 resolution, I've displayed graphics and text up to 1,024 by 768, and it did the job quite acceptably."

SERVICE AND SUPPORT OPTIONS

	Micropolis Corp.	Microscience International	Mitsubishi Inc.	Nanao USA Corp.	NEC Technologies Inc.	Northgate Computer Systems	Okidata	Orchid Technology	Packard Bell
TECH SUPPORT									
Telephone tech support for end users:									
Tech support without charge	■	■	■	■	■	■	□	■	■
Toll-free number	□	□	■	□	□	■	■	■	■
900 number (pay-per-call)	□	□	□	□	□	□	□	□	□
Hours when phone is attended (E.S.T.)	10:00a-9:00p	8:00a-12:00 noon, 1:00p-4:00p	11:00a-7:00p	11:30a-8:00p	8:00a-8:00p	24 hours	7:00a-9:00p	11:00a-8:00p	10:00a-9:00p
Tech support via bulletin board service	■	■	■	□	■	■	□	■	□
Manufacturer's warranty:									
Parts	1 year	1 year	1 year	1 year	1 year (monitors 2 years)	1 year	1 year	2 years	1 year
Labor	1 year	1 year	1 year	1 year	1 year (monitors 2 years)	1 year	1 year	2 years	1 year
REPAIR SERVICE									
Manufacturer offers repair service at its own plant	■	■	■	■	■	■	■	■	■
Pays shipping charges to/from plant	□ / ■	□ / ■	□ / ■ (■ / ■ for laptops)	□ / ■	□ / ■	□ / ■	□ / ■	□ / ■	□ / ■
Ships unit back by the same method customer used	■	□	■	□	■	■	□	■	■
Offers overnight shipping option	□	□	■	■	■	■	■	■	■
Ships replacement item out before receiving damaged item	□	□	■	□	■	■	■	□	□
Manufacturer offers service through authorized dealers	□	□	■	■	■	□	■	□	■
Authorized dealers must stock replacement parts	N/A	N/A	■	□	□	N/A	■	N/A	■
Manufacturer has dealer certification program	N/A	N/A	■	□	■	N/A	■	N/A	■
Manufacturer has dealer training program	N/A	N/A	■	■	■	N/A	■	N/A	■
Manufacturer offers service through service outlets	□	■	■	■	■	N/A	■	■	■
Manufacturer offers on-site service option	□	■	■	□	■ (□ for monitors)	■ (1 year free)	■	■	■
Service provider	N/A	Microscience	TRW	N/A	NEC	Bell Atlantic	Xerox	Orchid	AT&T Paradyne

■—Yes □—No N/A—Not applicable: the manufacturer does not offer any service in this category.

SERVICE AND RELIABILITY MONITORS

Davis also notes that his monitor is so reliable that he hasn't needed to call Relisys for technical support thus far.

Dr. Ronald A. Burnett, director and CEO of New Horizons Institute in Springfield, Missouri, likewise praises his Relisys monitor for its dependable, steady performance. "It's excellent," he says. "I've had no problems whatsoever. I've had other monitors, and they all gave me trouble. But I've had my Relisys for over a year, and I've never once had to call technical support." Although primarily an educator, Burnett also does some computer consulting work and recommends Relisys monitors to his clients. He plans to buy another Relisys soon. "They've proven themselves as far as I'm concerned," he says.

According to Relisys, producing reliable products and offering helpful service are necessities for keeping up with

the market, particularly the higher-resolution color monitor market. "We manufacture our own monitors, so we can maintain close scrutiny. When something goes awry, our entire chain of command goes on alert. We solve the problem before the product leaves our supervision."

For support after the product goes out the door, Relisys provides several options. "Our policy is to send end users either to their dealers for repair service or to the place from which they bought their monitors," says a spokesperson. "We have been known, however, to repair some warranty-covered monitors for end users, especially if their dealers have moved or gone out of business."

Relisys also maintains a toll-free hot line for technical support; the phones are answered from 11:00 A.M. to 8:00 P.M.

Eastern Standard Time. Since Relisys also provides monitors for a number of OEM companies, the company whose label is affixed to the monitor usually performs repair service for it. But if an OEM that bundles Relisys monitors has trouble with them, it can send the broken monitors back to Relisys for repairs.

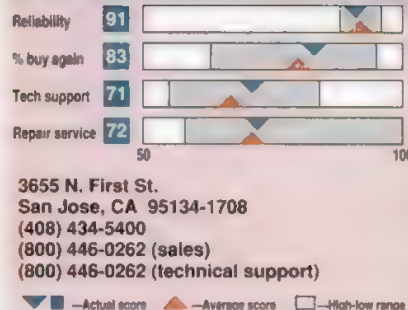
Overall, Relisys fares well on our survey. The solid reliability of its monitors and the loyalty of its customers, along with the excellent ratings for technical support and repair service, reflect the company's attitude towards its products.

CIRCLE 661 ON READER SERVICE CARD

Samsung Information Systems

by Christina Dyar

COMPANY SCORES



Like Sony, Samsung Information Systems makes televisions. And like Sony, that's not all the company does. Samsung Information Systems (not to be confused with Samsung Electron Devices America, an entirely distinct company that makes the Samtron line of monitors) is one of the largest monitor manufacturers, with over 8 million units sold worldwide. Samsung manufactures over 50 different monitors, including a number of popular EGA and VGA models. In our survey, the company proves that it has been adept at satisfying the customer, receiving competitive scores for reliability and for customer satisfaction with repairs and technical support.

Samsung achieves scores close to the average for monitors overall on most questions of reliability, suggesting that Samsung monitors are neither problem-laden lemons nor top-of-the-line performers. The company also has a fairly typical percentage of monitors with problems. Other average figures include the propor-

Panasonic Industrial Co.	Paradise Systems Inc.	PC Brand Inc.	Plus Development Corp.	Priam Systems Corp.	Princeton Graphic Systems	Relisys	Renaissance GRX Inc.
■	■	■	□	□	■	■	■
■	■	■	□	□	■	□	■
□	□	□	■	□	□	□	□
9:00a-5:00p	10:00a-8:30p	7:00a-11:00p	10:00a-8:00p	9:00a-9:00p	8:30a-5:30p	11:00a-8:00p	10:00a-8:00p
□	■	■	■	■	□	□	■
Varies	3 years	1 year	2 years	1 year	2 years	1 year (CRT 2 years)	1 year (VGA 2 years)
Varies	3 years	1 year	2 years	1 year	1 year	1 year	1 year (VGA 2 years)
■	■	■	■	■	■	■	■
□ / ■	□ / ■	□ / ■	□ / ■	□ / ■	□ / ■	□ / ■	□ / ■
□	■	■	■	■	□	□	□
■	■	■	■	■	■	■	□
□	■	■	■	■	□	□	□
■	□	□	■	□	□	□	■
■	N/A	N/A	□	N/A	N/A	N/A	□
■	N/A	N/A	■	N/A	N/A	N/A	■
■	N/A	N/A	□	N/A	N/A	N/A	■
■	□	□	■	□	□	■	□
■ (selected models)	□	■ (1 year free)	□	□	■	□	□
Various	N/A	TRW	N/A	N/A	Bell Atlantic	N/A	N/A

CONTINUES

"Instead of going to the computer manufacturer for hardware service and to the various software companies for support, you can go to the VAR, who will take care of everything."

Bill Machrone
Editor in Chief
& Publishing
Director
PC Magazine,
October 17, 1989,
Page 67

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PrePress Systems Specialists

CIRCLE 195 ON READER SERVICE CARD

Formerly Raster Devices Direct, Inc.

MONITORS

tion of Samsungs that worked properly throughout the past year, the severity of a typical problem, and the percentage of Samsung monitors that have been impaired or unusable within the past year. A greater-than-average proportion of respondents say their monitors were always usable. But of those users who did experience a problem, the number whose Samsungs were impaired is slightly larger than the number whose monitors were totally trashed.

Would users be willing to return to Samsung to buy another monitor? 83 percent say yes, they would trust Samsung with their dollars again. Given the average length of usage for these monitors, they may not need to buy another one soon. A greater-than-average portion of survey respondents bought their monitors new, and they have used these units an average of 14 months—which is usually long enough to find any inherent problems with a product.

Of those users who have run across

problems, most have turned to Samsung, to their retailers, or to a direct marketer for technical support and repair service. Samsung and the retailers score satisfactorily, but the ratings show that users are particularly pleased with direct-marketer technical support from mail-order companies such as CompuAdd.

During the one-year warranty period, a higher proportion of respondents rely on Samsung for service. Samsung offers an on-site option through Interlogic Trace, as well as repairs at authorized service centers. To take advantage of the latter option, the user must have Samsung supply an RMA (return material authorization) to the service center before the monitor can be repaired there.

Says Robert E. Grant, proprietor of Grant Business Services in Putney, Vermont: "I've had no trouble at all with my monitor. I get good clear pictures and text. It's doing what it's supposed to do. It's as

good a monitor as I've seen as a monochrome, though not as a VGA monochrome. I can look at the amber screen for fairly long periods without eyestrain."

A Samsung spokesman explains: "For our overall support policy, we have an 800 number combined with a network of 500 authorized service vendors for monitors. All of our products are tested before they're shipped out. All the inspection for quality control is done in Korea. Then the distributors and dealers in the U.S. do an inspection prior to delivery to the customer to guard against DOA [dead-on-arrival] monitors."

SAMSUNG VGA MONITORS

Samsung's VGA models receive a strong reliability rating from respondents, despite a high percentage of problems with the monitors in the past year. The good news is that these problems get a low severity rating compared with the score for VGA monitors overall. The bad news is that a greater portion of the Samsung

SERVICE AND SUPPORT OPTIONS



	Samsung	Seagate Technology	Seiko Instruments USA	Seikosha America Inc.	Sharp Electronics Corp.	Sony Corp. of America	Star Micronics America	STB Systems Inc.	Swan Technologies
TECH SUPPORT									
Telephone tech support for end users:									
Tech support without charge	■	■	■	■	■	■	□	■	■
Toll-free number	■	■	□	■	■	■	□	■	■
900 number (pay-per-call)	□	□	□	□	□	□	□	□	□
Hours when phone is attended (E.S.T.)	10:00a-8:00p	9:00a-8:00p	11:00a-8:00p	9:00a-8:00p	9:00a-5:00p	9:00a-8:00p	11:00a-7:00p	9:00a-7:00p	8:00a-9:00p
Tech support via bulletin board service	■	■	□	□	□	□	□	■	■
Manufacturer's warranty:									
Parts	1 year	1 year	1 year	2 years	1 year	90 days	1 year	2 years	1 year
Labor	1 year	1 year	1 year	2 years	1 year	90 days	1 year	2 years	1 year
REPAIR SERVICE									
Manufacturer offers repair service at its own plant	■ (PCs only)	■	■	■	■	■	■	■	■
Pays shipping charges to/from plant	□ / ■	□ / ■	□ / ■	□ / ■	□ / ■	□ / ■	□ / ■	□ / ■	□ / ■
Ships unit back by the same method customer used	□	■	■	■	■	■	■	■	□
Offers overnight shipping option	■	□	□	■	■	■	■	■	■
Ships replacement item out before receiving damaged item	□	□	□	■ (laser printers only)	□	□	■	□	■
Manufacturer offers service through authorized dealers	■	□	□	■	■	■	■	□	□
Authorized dealers must stock replacement parts	■	N/A	N/A	■	■	■	□	N/A	N/A
Manufacturer has dealer certification program	■	N/A	N/A	■	■	■	■	N/A	N/A
Manufacturer has dealer training program	□	■	N/A	■	■	■	■	N/A	N/A
Manufacturer offers service through service outlets	■	□	□	■	□	■	■	□	□
Manufacturer offers on-site service option	■	■	□	■	□	■	■	■	■ (1 year free)
Service provider	Interlogic Trace	Seagate	N/A	Various	N/A	Cadmus	Various	STB Systems	TRW

■—Yes □—No N/A—Not applicable: the manufacturer does not offer any service in this category.

MONITORS

users are not particularly satisfied with the technical support and repair service they have received from all sources combined, including retailers, third-party service providers, and so on. The support and repairs that are provided by the manufacturer emerge as slightly better than the average.

The retailers' score for technical support looks somewhat cautionary. Of the five respondents who have contacted retailers for tech support, two give it the lowest rating, yet two give it the highest satisfaction rating, and one gives it the next-highest rating. Basically, you should be sure that your retailer has someone on staff familiar with Samsung VGA monitors before you purchase one.

The one Samsung VGA user who fixed his own monitor gives his own service a high satisfaction rating, which may reflect the relatively light severity of problems typical with these monitors. Another respondent, who went to a direct marketer for repairs, says he felt highly satisfied

with the service. At press time, we had not received any responses from Samsung to most of our findings.

SAMSUNG EGA MONITORS

Samsung also makes a number of popular EGA models. Samsung EGAs score 91 for reliability, which is slightly higher than the 89 mark for EGAs overall. The incidence of Samsung EGA monitors with problems is 15 percent, a little bit less than the 17 percent of EGA monitors overall with problems. Within the set of Samsung EGAs with problems, the percentage of monitors that have been unusable at some time within the past year falls short of the figure for EGAs. Samsung EGA users rate their satisfaction with technical support much higher than average, particularly in the context of technical support they have received directly from Samsung and from their retailers.

While the incidence of problems with

Samsung

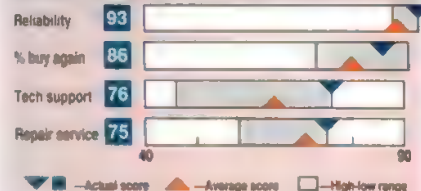
VGA monitors



EGA monitors



Samsung CM 4531



Samsung EGA monitors is slightly lower than average for EGA displays overall, Samsung's repair service met with kudos from its EGA respondents: a greater proportion of the users who went to Samsung for repairs had positive experiences with the manufacturer service. 85 percent of these EGA respondents would buy a Samsung monitor again—a slightly better proportion than the overall average for EGA users.

Dave Whitaker, a machinist with Wilson Engineering in Indianapolis, Indiana, used tech support from a direct marketer, Gateway 2000, for his Samsung EGA monitor. He says: "I called up Gateway and they immediately sent me a new one. The replacement is a multiscanning monitor, better than the original one. I've been extremely satisfied; it's been great. I had some problems with the new driver. I was originally getting a dark green background; on a similar setting, the new one has been blue. But it's had flawless operation."

SAMSUNG CM 4531

One Samsung EGA model, the CM 4531, receives high marks for reliability among survey respondents, with a score of 93, which slightly surpasses the 89 average for EGA monitors overall. Problems have occurred with only 11 percent of our respondents' CM 4531s. Within this group, the percentage of unusable monitors is

Tandy Corp.	Tatung Co. of America Inc.	Taxan USA Corp.	Toshiba America Inc.	Western Digital Corp.	Wyse Technology Inc.	Zenith Data Systems	Zeos International
■	■	■	■	■	■	□	■
□	■	■	■	■	□	□	■
□	□	□	□	□	□	□	□
9:00a-6:30p	10:30a-8:30p	11:00a-7:45p	9:00a-12:00 noon, 1:00p-5:00p	10:00a-8:00p	10:00a-8:00p	8:00a-8:00p	24 hours
■	□	■	■	■	■	□	■
1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year
1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year
□	■	■	■	■	■	□	■
□/■	□/■	□/■	□/■	□/■	□/■	□/■	□/■
□	■	□	■	■	□	□	■
■	■	■	■	■	■	■	■
□	■	□	□	□	□	■	■
■	■	□	■	■	■	■	□
□	Canada only	N/A	■	□	■	■	N/A
■	□	N/A	■	□	■	■	N/A
■	■	N/A	■	□	■	■	N/A
■	□	■	■	□	■	■	□
■	□	□	□	□	■	■	■
Radio Shack	N/A	N/A	N/A	N/A	Interlogic Trace, TRW	Zenith	TRW

ENDS

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CIRCLE 327 ON READER SERVICE CARD

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MONITORS

substantially below the figure for EGAs in general.

Samsung evidently provides excellent tech support for the few CM 4531 users who need it. The small number of respondents who have consulted Samsung for support give the company thumbs up. A considerably greater-than-average proportion of users have tried the company's tech-support hot line, and they have been very satisfied with it.

Samsung Information Systems gives users what they expect and need—not a lot more, but certainly not a lot less either.

CIRCLE 662 ON READER SERVICE CARD

lead its competition in manufacturing a low-cost, feature-rich monitor.

In our survey, 75 percent of the total pool of monitor respondents rate their units as very reliable. Seiko monitor users are on a par with the rest, with 78 percent of them awarding their monitors this high reliability rating. 88 percent of the Seiko users indicate their willingness to buy

from the same manufacturer again, compared with 80 percent of the monitor respondents overall.

12 percent of the Seiko respondents have experienced problems at some time with their monitors. Within this group, the monitors have been impaired or unusable an average of six times within the past year; that figure compares with an average of five occasions for all monitor users surveyed. Fortunately, the severity rating

Seiko Instruments USA

by Donna J. Gaccino

COMPANY SCORES



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San Jose, CA 95131
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(800) 888-0817 (sales)
(800) 888-0817 (technical support)

—Actual score —Average score —High-low range

Most people know Seiko as "the watch company." But it wasn't long before Seiko discovered that manufacturing those wrist-watch chips gave it inroads into the personal computer industry. In 1988, Seiko Instruments USA formed a separate PC products division, which has been responsible primarily for selling high-resolution monitors, graphics tablets, digitizers, and other peripherals.

Was this a smart move in the eyes of the public? How do Seiko's customers feel about the reliability of its monitors and about the company that made them? The individuals who have responded to our survey reveal favorable opinions. Seiko monitors fare well in reliability ratings, scoring at about the same high level that monitor companies earn overall. Many of the 152 Seiko respondents have either the color VGA CM-1430 or the recently introduced multiscanning CM-1440, which works with CGA, EGA, VGA, Super VGA, and 1,024 by 768 adapters. This model has allowed Seiko to

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SERVICE AND RELIABILITY MONITORS

for a typical problem with a Seiko monitor is only 38, a wide 19 points below the average of 57 for all monitors. Based on this statistic, a Seiko monitor user could expect less severe problems than most monitor users have to face.

In assessing these favorable reliability statistics, bear in mind that the average Seiko monitor is comparatively new. Among Seiko users, the average length of usage is only 9 months, while among the pool of survey respondents overall, the average length of experience with a monitor is approximately 20 months. If our Seiko respondents had used their monitors as long as the typical respondent, Seiko's reliability ratings might possibly level out at just about average.

RESTRICTED SERVICE POLICIES

For technical support calls, Seiko runs a hot line, which customers can reach between 11:00 A.M. and 8:00 P.M. Eastern Standard Time. Since the number is not toll-free, long-distance customers have to pay to call San Jose, California. The tech-support number is otherwise free of charge, and there's no limit on the period within which a user can call.

Seiko monitors come with a one-year parts-and-labor warranty. Unfortunately, Seiko does not offer an extended warranty at this time. A customer who requires manufacturer servicing has to receive authorization from the technical support department and then ship the monitor to Seiko. Customers cover the shipping costs unless the monitor is sent back to Seiko within 30 days. Seiko covers the charges for returning the monitor to the customer. We hope the customer won't need the monitor repaired in a hurry, because the turnaround time is about five working days. An on-site service option might speed things up a bit, but Seiko does not offer one at this time.

Customers may wish to turn instead to their dealers for repairs. Unfortunately, Seiko has no standard dealer policies. In fact, Seiko has no officially authorized dealers, no dealer certification, and no dealer training. As a trifle of consolation, dealers do receive newsletters from the manufacturer.

Seiko explains: "We try to provide the best service we can. We're currently in the process of expanding the facilities for service nationwide, not only at one location; we expect that this will vastly increase the satisfaction factor. Dealers don't provide repair service for Seiko products.

The training that goes on is in conjunction with our distributors. Periodically we organize seminars wherein discussions are carried on about products, but the repair service is provided by Seiko Instruments exclusively. That way, we can ensure a consistent level of quality."

The two respondents who have turned to Seiko for repair service give it middling scores. Three respondents went to direct marketers for repairs; one gives it the highest rating, another the next-highest, and the third gave it the poorest rating. The one respondent who went to his retailer for repair service awards it the highest satisfaction rating. (It may sometimes be in the best interest of competent retailers to operate independently of the manufacturer in providing service.) Mainly because of the one retailer score, Seiko ranks above average for customer satisfaction with repairs from all sources.

As for technical support, the average overall satisfaction rating for monitors from all manufacturers is 67, while Seiko rates a 75. But if the focus is on satisfaction with support provided directly by the manufacturer, Seiko rates even further above average.

Bob Nellans of Argos, Indiana, is a general partner in Nellans and Nellans, a firm that does consulting work in programming. Regarding his Seiko CM-1430, a multiple-fixed-frequency VGA monitor that scans up to 1,024 by 768 resolution, he says: "I've been well satisfied. It's been quite reliable. When I first tried to use it, I found an intermittent power problem. The technician with Seiko advised me to check the power cord; once in a while, some excess plastic from the molding process finds its way onto the contacts of the power cord, in the spot where it has to make contact with the pins on the back of the CRT. I checked the cable, and sure enough, there was a little extra material. A knife soon solved that problem.

"There is also a video mode I need that this particular monitor isn't set for. Seiko says that if I send it back, the technicians will make adjustments but will not replace any components. I just don't want to wait the amount of time it would take for them to send it back.

"Once you get used to that superb VGA quality, it's hard to give it up," Nellans concludes. "I'm a stickler for excellent resolution."

According to Seiko: "Many people

have expectations of a product getting results that were not meant to be, as with our CM-1431 monitor, which is not designed to display Super VGA. Keep in perspective that the failure rate for our monitors is less than one-half of 1 percent. Nevertheless, we're happy to hear about exactly what problems there are."

As long as Seiko and its retailers manage to keep on top of any reported problems, its monitors will probably continue to be reliable, and its service satisfactory.

CIRCLE 663 ON READER SERVICE CARD

Sony Corp. of America

by Nathaniel Zelnick

COMPANY SCORES



Sony Dr.
Park Ridge, NJ 07656
(201) 930-1000
(800) 222-SONY (technical support)

■ Actual score ▲ Average score □ High-low range

Sony Corp. has become synonymous with personal electronic components. Think of the company that has brought us the Walkman, hand-held televisions, and compact disks, and of all the scope and success this megacorporation has enjoyed. What can't Sony do? Well, according to our survey respondents, Sony can't service its monitors to their expectations.

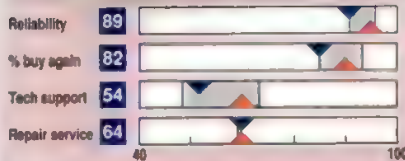
While our survey shows that Sony monitors are generally reliable products, scoring the overall average of 92, it also reveals a higher incidence of problems. Technical snags occur with greater-than-average frequency within the 17-month usage period typical of Sony respondents. Sony's line of monitors with 1,024 by 768 resolution suffers from a heavy incidence of problems, along with an above-average number of occasions in the past year when the monitors were either impaired or unusable. One model in this line, the multiscanning Sony CPD-1302, has averaged three times as many problems in the past year as the typical multiscanning or 1,024 by 768 monitor.

Sony Corp. of America

1,024 by 768 monitors



Sony CPD-1302



—Actual score —Average score —High-low range

But the greater difficulty is Sony's customer service system. Although Sony advertises an 800 number for consumer questions, this hot line serves as a clearinghouse for the entire Sony product line. Callers are directed from their toll-free call to a toll number for the repair depot in New Jersey ((201) 222-SONY).

39 percent of the users are not aware that Sony has a telephone hot line. Those who do get through say they are not happy with the hot line: only 27 percent of those who have tried it rate that feature positively (by comparison, 64 percent of all monitor respondents who have tried tech-support hot lines give them positive scores). Another 49 percent are unsatisfied with the hot line; for monitor users overall, the average would be only 17 percent.

Among the 27 percent of the Sony respondents who have needed repairs performed on their monitors, 8 percent went directly to Sony for repairs, while another 8 percent relied on their own mechanical instincts; these were the sources most frequently used. Those who did turn to the manufacturer for service are, by and large, less satisfied with the help they received than the average monitor user. Those who went to retailers or direct marketers rate their service above average, while third-party providers rate below average.

SONY 1,024 BY 768 MONITORS

The Sony displays that are compatible with 1,024 by 768 adapters (otherwise known as 8514/A units) include the CPD-1302, the CPD-1304, and the Multiscan HG. These displays all include multiscanning abilities and attract buyers who see in them an upgrade path through video boards

SERVICE AND RELIABILITY MONITORS

with successively sharper resolution.

Sony's line of 1,024 by 768 monitors exhibits an even higher incidence of problems than Sony monitors in general; 24 percent of them have malfunctioned. Compare this with a problem incidence of 12 percent for 1,024 by 768 monitors overall. On the average, the Sony high-res monitors have been impaired or unusable

on 12 occasions in the past year, while the average is only 5 occasions for a typical 1,024 by 768 monitor.

Many of our readers write with mixed feelings about their Sony monitors. They love the monitors' performance when the units are working, but they also have to suffer through periods of downtime. John Merriman, Jr., a senior environment analyst with the New York State Department of Environmental Studies in Cortland,

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When you're working, there's only one thing worse than being interrupted. Being interrupted by your own PC. But when you stop to format a disk, it makes you stare at a blank screen for about 2 minutes. Format the whole box, and you lose close to 20 minutes. And if you ever have to format a data cartridge tape, your machine is out of action for as much as 2 hours.

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3M

SERVICE AND RELIABILITY MONITORS

New York, writes: "I like my Sony monitor [a CPD-1304] very much. It has great colors and sharp text. However, my initial experience was a disaster. After four months of Sony trying to repair it, they finally replaced it. The new one works fine."

Merriman first went through the 800 number but was quickly sucked into Sony's service labyrinth. "I think that they're so big," he says, "that they handle just about every appliance through that line, so I sort of got handed around." It wasn't until Merriman wrote to the company that he began to get a real response. A service representative found the machine languishing in the Sony service depot in New Jersey and shipped it back. Still it failed to function. Finally Merriman suggested that Sony replace the monitor, which the company did in only two weeks. "Once things got to the ridiculous point, they acted pretty quickly," Merriman says.

Merriman credits most of the CPD-1304's service problems to the newness of the machine, saying, "They didn't have parts and people didn't know how to repair it." In the four-month interim, Sony supplied him a lower-level monochrome VGA monitor as a loaner, but he was greatly relieved when he finally had his color, multiscanning CPD-1304 up and running. He is pleased with its performance and has suffered no problems since.

A Sony spokesman acknowledges the problems with service, and particularly with the CPD-1304. "We're faced with a two fold problem," he admits. "First, we moved from the East to the West coast as of June 1. But this has been going on for months, and we didn't get ramped up on spare parts for the 1304 when we introduced it." Users of Sony monitors can only hope that the company will have these problems ironed out soon.

SONY CPD-1302

Sony rates its CPD-1302 at a resolution of 900 by 560, but it can actually work with a wide range of adapters, including a 1,024 by 768 video card. *PC Magazine* has reviewed the multiscanning Sony CPD-1302 twice (May 16, 1989, and May 15, 1990). The later review stated, "It produces good image quality with any standard IBM display adapter, although it autosizes only in its VGA operating modes."

Respondents give this model a reliability rating of 89, which is nearly as high as the averages for all 1,024 by 768 and

multiscanning monitors. This monitor has also won a fair degree of loyalty: 82 percent of the respondents who use it say they would buy from Sony again. This figure is slightly below the averages for 1,024 by 768 and multiscanning monitors overall.

Despite these positive findings, the monitor has produced even more problems than the typical Sony monitor of the 1,024 by 768 type. The Sony CPD-1302 chalks in with an average of fifteen malfunctioning periods within the past year—three times the usual number. This translates to a telling 28 percent of all Sony CPD-1302s having had problems, compared with a survey average of 12 percent for 1,024 by 768 displays and 11 percent for multiscanning monitors.

Charles Bakke, PC coordinator for a California state government laboratory, complains about inconsistencies in a batch of CPD 1302-A's that he bought through a vendor. "The original seven had an annoyance," he says. "They wouldn't dim enough to create a real black background. Not anything that I would call in a technician for, though. The next five couldn't achieve the image of the first seven in color or in monochrome." These five he sent back to Sony through the vendor—who was not an authorized Sony dealer; then he waited two weeks for the recalibrated machines. When these came back, two had to be sent back again. "I was convinced that the problem originated in the factory," Bakke remarks. He isn't sure how much extra time was lost in shipping between the vendor and Sony, but he has vowed to go through an authorized dealer next time.

PC Magazine has also had a problem trying to find the right person at Sony. In trying to locate someone willing to answer questions about the clash between Sony's excellent technical rating and dismal service record, we went through dozens of phone calls, multiple faxes, conversations with representatives at outlying authorized service centers, and several contacts with Sony's public relations firm before our questions were finally referred successfully to a Sony employee in Japan.

Tom Rizol, director of marketing and sales for Sony, says that his office is aware of this problem and doing its best to correct it: "We just finished a customer service retraining last month, and we've just opened a service bureau in our San Jose

center, so now we have repair depots for monitors on both coasts and people who can direct customers to them. We've also initiated an authorized dealer program in June. Three or four of our major dealers have signed on or expressed interest."

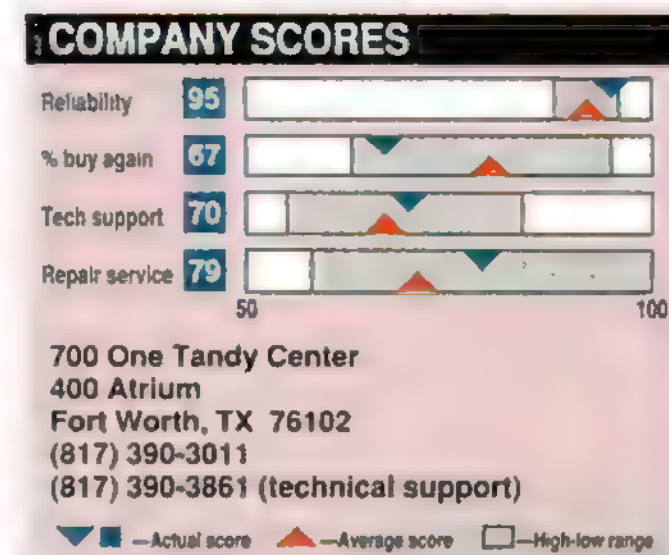
Sony arguably makes some of the best mass-market video imaging equipment in the world. Respondents are overwhelmingly impressed with the quality of the working product—when it does work. Sony scores slightly above the average in terms of the percentage of customers who would buy their monitors from the same firm again.

Rizol sums up Sony's technical support problems by commenting on the mass market the company covers. He explains that Sony originally tried to treat its monitors the same way it treated its televisions but has since altered this program. "I came into this job a year ago, and I'm not anywhere near satisfied," he says, "but I think that we're on the right track now."

CIRCLE 664 ON READER SERVICE CARD

Tandy Corp.

by William P. Flanagan



Let's face it: when people think of Tandy, they generally think of Radio Shack. Now Radio Shack does not inspire thoughts of cutting-edge technology. It inspires thoughts of radio-controlled cars, walkie-talkies, and other assorted Christmas gifts. But in 1977 Tandy Corp. entered the personal computer market, and it has since established itself as a reputable manufacturer of computer products, backed by its own research and design group.

Included in this group is a broad network of retail outlets for sales and service. Unlimited tech support is available following each purchase, with a full-time staff of 125 people manning the phones

Tandy Corp.

CGA monitors



Tandy CM-11



Tandy CM-5



Legend: ■ Actual score, ▲ Average score, □ High-low range

from 9:00 A.M. to 6:30 P.M. Eastern Standard Time. Although there is no toll-free number for tech support, help is available via the on-line services CompuServe and PC-Link.

Tandy's easily accessible service outlets have made many Tandy users happy, including Robert W. Ziehm, a district manager for Howard Soil Conservation District in Ellicott City, Maryland. He says, "I chose Tandy especially because of its extensive network of stores where all add-ons and service are available. And the compatibility with the computers at work allows me to bring work home and improve my skills."

In *PC Magazine's* survey, Tandy receives respectable feedback. We have received responses from 587 users of Tandy monitors, 318 of them CGA. Respondents often cite two particular CGA monitors, the Tandy CM-11 and the Tandy CM-5, which receive 176 and 108 responses, respectively. The average reliability rating of the Tandy monitors climbs slightly above the overall average, while the percentage of Tandy monitors that have been impaired or unusable in the past year is significantly lower than the average for all monitors in the survey. The severity of the problems reported also rates much lower than for most monitors.

Yet among all these encouraging numbers, the responses show that many current Tandy users would not buy from

the company again. Meanwhile, the average satisfaction ratings for service and technical support—which come out above average—suggest that the respondents' reluctance is not due to any major failings in these departments. When a problem does arise, it's more frequently an impairment than a problem that renders the monitor unusable. And a larger-than-average proportion of the Tandy users chose their machines themselves. Many of them, while happy with their choice, say they now know of better values elsewhere with better PC compatibility and a greater array of available add-ons.

Dennis Young, a petroleum engineer for Chevron USA in Snyder, Texas, has had his Tandy computer for over two years. He states, "I have had no problems or complaints about Tandy. But in the future I would only buy a Tandy product if it were 100 percent PC compatible. My next purchase probably would not be a Tandy due to the company's noncompetitive prices."

Other survey respondents feel that Tandy has slighted them because they can't go outside the company for products that might be faster or cheaper. Keep in mind that a large base of customers buy their first computers from Tandy and aren't aware at the time of the possibilities offered by the open architecture of most IBM-compatible PCs.

A Tandy representative acknowledges this problem and responds, "Our monitors are PC compatible now, and we are moving to the point where all of the products we offer in the future will be 100 percent PC compatible."

This new development, along with the satisfaction already visible in our survey responses, should keep Tandy in the mainstream of personal computing.

TANDY CGA MONITORS

Many of the responses for Tandy's CGA monitors coincide with those for the rest of the Tandy monitor line. They have a high reliability rating—slightly greater than that of CGA monitors in general. Compared with CGA monitors from all manufacturers, a smaller proportion of the Tandy CGA monitors have been impaired or unusable within the past year. But among that small group, fewer malfunctioned just once; more of them became impaired or unusable two or three times.

As with Tandy monitors in general, the typical severity of the CGA problems is lower than the overall average for CGA monitors. The percentage of Tandy CGA users who would buy again from the same manufacturer comes close to the norm for CGA users overall.

TANDY CM-11

Tandy CM-11 monitors earn a high reliability rating, a few points greater than the overall average for CGAs from all companies. Out of the relatively small group of Tandy CM-11 monitors that have ever had problems, a greater proportion have worked properly throughout the past year, compared with CGA monitors from all manufacturers. The average severity of a problem also comes out lower than for CGAs overall.

On the other hand, fewer CM-11s have been in use for over three years, which may be one reason for the low incidence of recent problems and their light severity. Nevertheless, many CM-11 users seem to feel encouraged by their experiences with Tandy so far. 69 percent of them would buy again from this manufacturer, which is close to the average for CGA users in general.

John D. Minott, senior project manager for ERM-Midwest Inc. of Delaware, Ohio, was using a Tandy CM-11 when he filled out our survey. He says now: "I had the Tandy CM-11 for two and a half years and had no trouble with it whatsoever. In fact, I just sold it to someone, and it was in absolutely perfect condition. I have recently bought a new monitor—not a Tandy because they're a little too expensive to upgrade. But I think that the Tandy was a good unit: good clarity, good quality."

TANDY CM-5

Results for the Tandy CM-5 agree in many respects with those for the Tandy CM-11 or for Tandy CGAs overall. The reliability rating is roughly on a par with all CGA monitors, which in itself is a high figure. As with the CM-11, when you compare the CM-5s with all CGAs as a group, you find that a greater-than-average percentage of the units that ever had problems have worked properly all through the past year. Likewise, problems with the CM-5 are generally less serious than for the typical CGA display. And again, a relatively small proportion of CM-5 monitors have been in use for more than three years.

We did note that a greater-than-usual percentage of CM-5 users are responsible

SERVICE AND RELIABILITY MONITORS

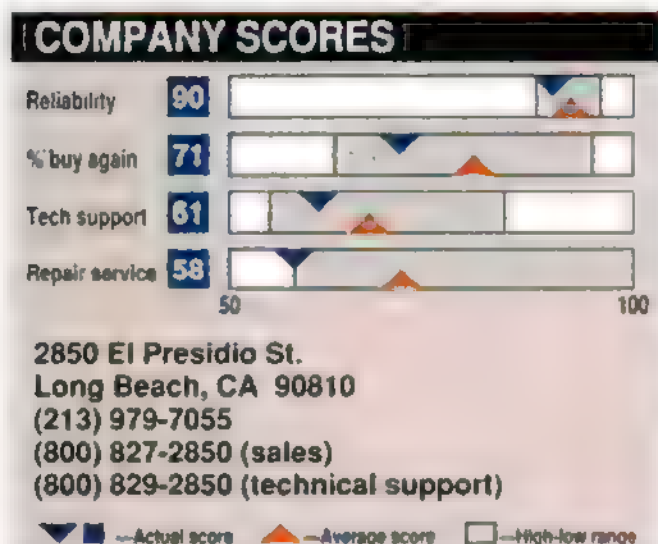
in an informal way for choosing computer equipment, either for their own use or for a worksite or organization, without having been formally named to this task. However they chose the monitor, 70 percent of the Tandy CM-5 respondents say they would buy from the manufacturer again, and this figure is nearly as high as the percentage for CGA users overall.

This comment comes from Kenneth S. Koscielski, sergeant first class at the U.S. Army base in Wismar, New Mexico: "I have had it for two years. Compared with other monitors, I think it's a great buy. I have never had any problems with it, and I've never had to call technical support to get help with monitor problems. I think I got what I paid for. It doesn't have any special features; it just gets what I want done."

CIRCLE 665 ON READER SERVICE CARD

Tatung Co. of America Inc.

by Michael Cohn



Tatung Co. of America produces monitors, graphics boards, PCs, and consumer electronics products. An affiliate of a Taiwan-based company, it has served the U.S. market as a private concern since 1973. Our survey respondents generally rate the overall reliability of Tatung's products positively; this company's score approximates the same high average we find for monitors overall. Only 15 percent of the 163 people writing to us about Tatung monitors have ever experienced a problem. This figure comes close to the average percentage for all monitors.

Within this small group of 25 users, the monitor problems are often relatively severe. About half of this group classify their problems as very serious, compared with 32 percent overall.

Direct marketers, including mail-order companies, enjoy the highest rating for customer satisfaction with their technical support in solving problems. Further down in the ratings comes Tatung itself, followed by retailers. These results suggest that Tatung's reputation rests partly on the abilities of direct marketers like Gateway 2000 that sell Tatung monitors with their systems. But only 2 percent of our respondents claim that they have actually contacted direct marketers.

The few respondents who went for repair service to Tatung gave it a mixed reaction. Two respondents went to third parties and say they were not satisfied. The one person who went to a direct marketer gives its repair service the highest satisfaction rating. Those who made repairs themselves are more satisfied than those who had the retailer, the manufacturer, or a third party make repairs. Nevertheless, their satisfaction with do-it-yourself fixes is not on a par with the overall average for monitors. Perhaps Tatung displays are not as easy to fix as the typical monitor when they break down.

Luckily, more people have noticed problems during the warranty period rather than after. This makes sense, given the duration of Tatung's warranty—one year for parts and labor—along with the fact that our respondents have been using their monitors an average of 15 months. Tatung recently began to offer extended warranties of up to 7 years.

FREE ADVICE

Despite the problems experienced by a few respondents, 71 percent of the Tatung users would buy from the company again. That figure comes close to the average of 80 percent for all monitors. Tatung's support policies may contribute to this attitude. The company offers free technical advice from its two 800 numbers for the life of the product. About 10 percent of the respondents have contacted Tatung directly for technical support; these contacts outnumbered calls to retailers, direct marketers, or third-party companies.

The figures involved may seem low, but they're roughly in line with the average. One reason may be that over a third of the respondents say they did not know of the company's technical-support hot lines, a figure that also comes close to the average. Of the 9 percent who have actually used the hot lines, an unusually high pro-

portion pronounce themselves very satisfied. Tatung and other vendors really should advertise such a number to their customers more widely.

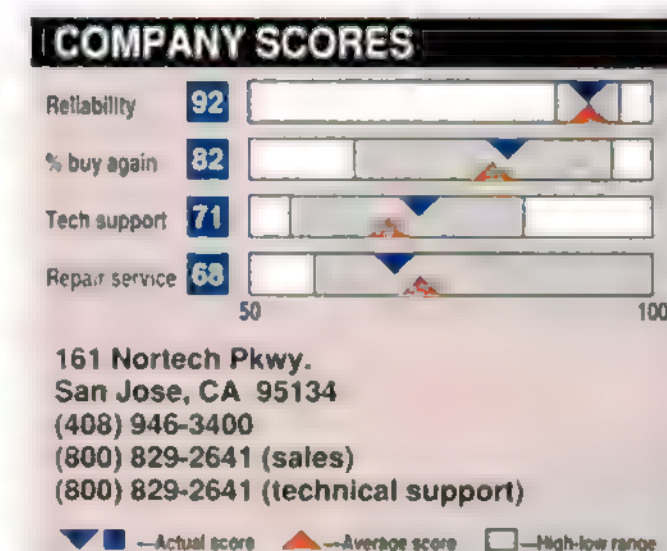
In the meantime, many Tatung users will probably rely on direct marketers like Gateway 2000 for support. "The computer was purchased complete from Gateway 2000, a very nice computer with great support," writes Harold Bartlett, who runs a desktop publishing business in Mankato, Minnesota. "I didn't look for the monitor that came with it, a Tatung Crystal Scan with an ATI video card, but it was everything I wanted. I didn't have to mess with the adjusting or the sizing. I was really impressed with everything about it."

Tatung says, "Tatung monitors—whether sold under our own name or the label of another company—reflect our commitment to producing high-quality, reliable products that are widely compatible. We fully inspect and perform a 48-hour burn-in of every unit before it leaves our plant. Plus, we spot-test our monitors to ensure that they will deliver an average of 30,000 hours of service." Quality control procedures such as the ones Tatung claims may be the reason for its high reliability rating and low incidence of problems.

CIRCLE 666 ON READER SERVICE CARD

Taxan USA Corp.

Michael W. Muchmore



For Taxan monitor users who have responded to our survey, reliability is no problem. The company earns a reliability rating equal to the high average score of 92 that monitor manufacturers achieve overall.

Taxan USA Corp. has been making high-resolution, large-scale monitors since it was founded in 1981 as a subsidiary of Kaga Electronics, a Tokyo concern. Its



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surprised to see
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\$8500

Compaq

10,040

CompuAdd

\$4995

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So what else could be behind the CompuAdd name?

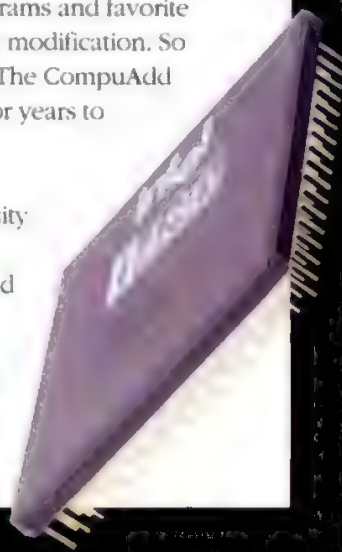
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Surprise! We've been comparing the competition's 386-based machines to the state-of-the-art CompuAdd 425. Based on the revolutionary Intel 486 microprocessor — the "mainframe on a chip" — the CompuAdd 425 provides astonishing performance *at less than half the cost* of these 386s. And the value doesn't end there. You can continue to run all your old DOS programs and favorite 286/386 applications without modification. So why buy 386 obsolescence? The CompuAdd 425 will be *the* technology for years to come.

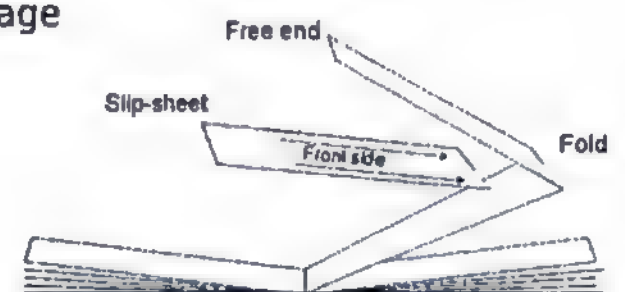
So what's behind the CompuAdd name? High-quality components, superior performance, affordability and leading-edge technology.

And what's in front of the CompuAdd name?

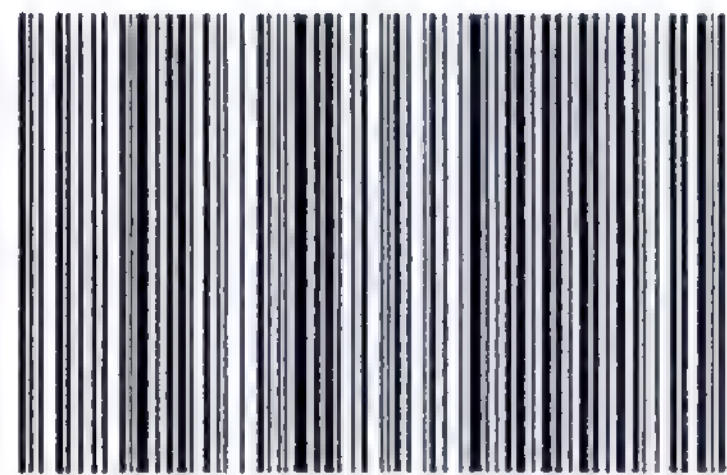
A lot of smiling faces.



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4. Close the page and slip-sheet



Foldout slip-sheet

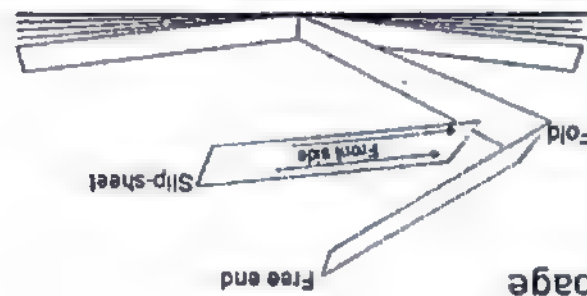


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Inverted Foldout slip-sheet

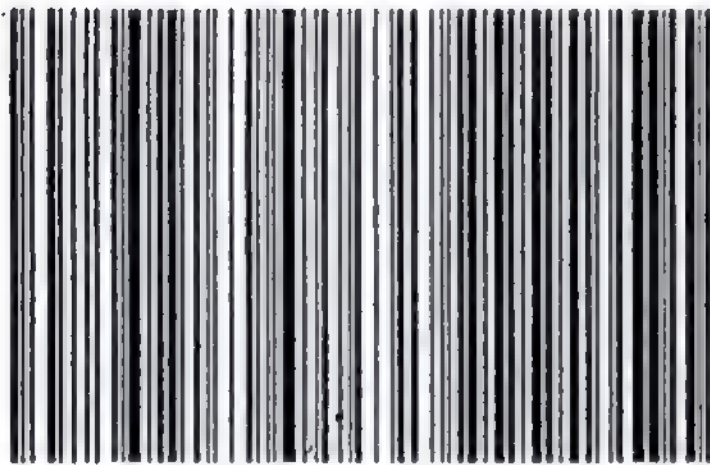
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4. Close the page and slip-sheet



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Inverted Back



GbsSlipBack-0018

Back

1. Follow instructions on the other side



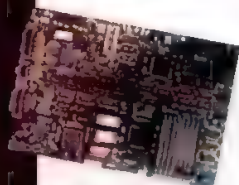
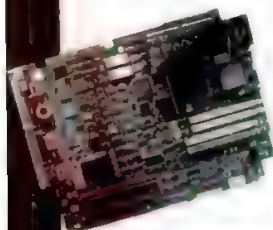
Is it the motherboard?

Look inside an IBM® PS/2 Model 70-386, a Compaq® Model 84-386 and a CompuAdd® system. See any visible differences? All three companies design and

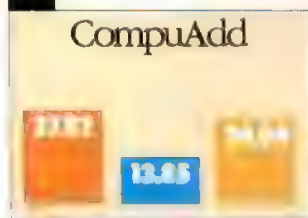
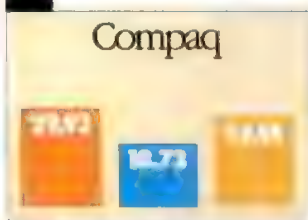
manufacture their own motherboards. They all use an Intel microprocessor and offer a number of available expansion slots (three on the IBM, six on the Compaq and five on the CompuAdd).

Each motherboard uses advanced surface-mount technology and top-quality components. Each manufacturer offers a choice of memory configurations, internal storage devices and a host of other options to create

a flexible computing environment. And all three support DOS applications and VGA graphics modes.



Is it performance?



We ran head-to-head benchmark tests* on these systems under three CPU-intensive applications: PageMaker, Magellan/1-2-3 and AutoCAD. While the results were no surprise to us, they might surprise you. Under PageMaker, CompuAdd performed 43% faster than IBM and 7% faster than Compaq. Running Magellan 1-2-3, CompuAdd was 46% faster than IBM and 26% faster than Compaq. And under power-hungry AutoCAD, CompuAdd outran IBM by 42% and edged Compaq by 8%.

PageMaker®
Magellan®
AutoCAD®

(*Completion time in seconds)

CompuAdd 425

System price: \$4995 (66652)

The technology of tomorrow is here! The CompuAdd 425 delivers 25MHz, i486 microprocessor computing to your desktop — power for the most demanding spreadsheet, database, network or CAD/CAM applications. The CompuAdd 425 offers full MS-DOS, OS/2, SCO XENIX and Novell compatibility. Step up to the next generation of computing with the CompuAdd 425!



The CompuAdd 425 is FCC Class A Approved. See manual for residential use.

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- Diskette controller and hard drive interface on motherboard
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- Windows 3.0 software
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CompuAdd 425 Enhanced Configuration

- Super high-resolution (1024x768) color VGA monitor
- CompuAdd 16-bit Hi-Res VGA card
- 110MB hard drive
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- Color VGA monitor and graphics adapter
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- **FREE** one-year onsite service
- **Base system price: \$2889 (64842)**

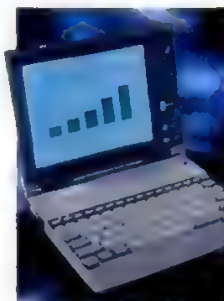
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The CompuAdd 316SL packs the computing power of the 386SX into a convenient laptop at a price far below competitive models. The 316SL gives you flexibility to run your favorite 286 application or new 386 multi-tasking programs.

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- Compact dimensions of 8.5" x 11" x 1.4"
- MS-DOS 4.01, LapLink II in ROM
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SERVICE AND RELIABILITY MONITORS

lineup includes three *PC Magazine* Editor's Choices: the Taxan Crystal View (reviewed in our issue of March 29, 1988), the UltraVision 1000 (February 14, 1989), and the MultiVision 770 Plus (May 16, 1989).

There are about 1.3 million 12- and 13-inch Taxan monitors in the field, but while the company continues to support these models, they no longer are a part of the available lineup. Last year, Taxan decided to consolidate on larger, higher-resolution products.

According to our survey, about a third of the Taxan users are between 35 and 44 years of age, and about a quarter of them between 25 and 34. Most have had experience tinkering with the innards of their system units. (Incidentally, this is also true for all the companies profiled in the monitor section of this issue.) A slightly higher-than-average percentage of the responding Taxan users are brand specifiers and were able to choose which manufacturer's monitors would be bought.

The percentage of problem units and the proportion of Taxan users who would buy from the same company again are roughly equivalent to the corresponding scores for all monitors in our survey. Moreover, Taxan monitors have a much longer average length of service than most monitors (31 months), and 29 percent of the Taxan users answering our survey have been using their screens for more than three years.

The one problem that seems to be an issue is screen blanking, which 7 of the 164 Taxan respondents report. A com-

and IBM monitors, and I don't like them as much as my SuperVision. I see a lot of hardware that comes in for repair and never see Taxan, so I assume they don't break down."

Taxan provides a one-year parts-and-labor warranty for all of its products. The firm also offers the Zero Wait Program for the high-end UltraVision models. With this service, if you have a problem with your monitor, you will receive a working unit within 24 hours. Taxan also has the Express Warranty Program, a service upgrade for the MultiVision 770 Plus and the SuperVision 790.

The company has five authorized service centers to do repairs. It uses the standard system of mirror shipping: you pay for sending your unit to Taxan for repair, and the company pays the return costs.

There is no charge for technical support from Taxan and its service center in Santa Ana, California. Using the company's 800 number, you can call and reach a friendly technical representative in less than a minute.

In our survey, the overall level of satisfaction with technical support for Taxan monitors rates about average. Satisfaction with the repair service is also about average, and much higher when the retailer is the source of it. As this issue goes to press, Taxan is in the process of establishing an authorized dealer system that potentially may improve satisfaction with retailer service even more.

The bottom line: 77 percent of the

Taxan offers its Zero Wait Program for the UltraVision models. If you have a problem, you get a working unit within 24 hours.

pany representative says that this may have resulted from a shipment of between 100 and 200 Taxan 765s with defective power components.

POSITIVE FEEDBACK

We have received positive comments from all manner of survey respondents with Taxan monitors, from investment analysts to an Alaskan exploration manager. Robert L. Morrison, a senior service technician for Computer Hospital Inc. in West Haven, Connecticut, says: "I've seen NEC

Taxan users give this company the highest rating for overall reliability, and 80 percent say their Taxan monitors meet their needs. On the average, the latter group expect the monitor to continue meeting their needs for another 26 months. A full 82 percent indicate that they would buy a Taxan product again.

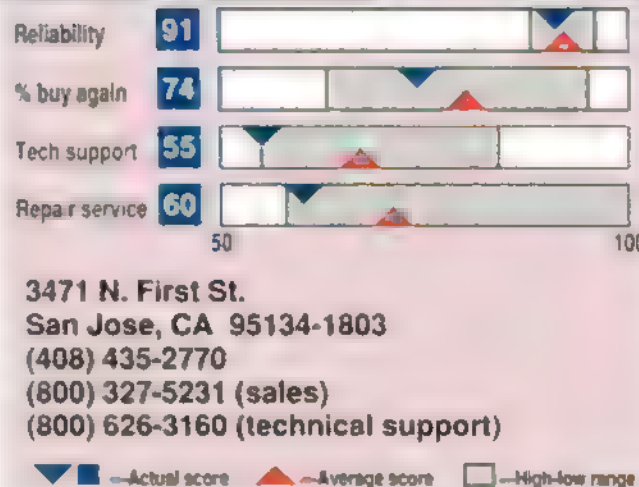
It seems clear that owning a Taxan monitor is not a taxing proposition. The company has proven itself to be pretty much risk-free.

CIRCLE 667 ON READER SERVICE CARD

Wyse Technology Inc.

by Kellyn S. Betts

COMPANY SCORES



All you need is a cursory glance at the scores in its company score box to determine that Wyse Technology has a service and support problem. Although our survey respondents judge the acclaimed monitors bearing the names of Amdek and Wyse to be no less reliable than their peers, the ratings for the manufacturer's technical support and repair service are significantly lower than average.

The existence of this problem is no news to Wyse Technology, the nine-year-old California-based company that acquired Amdek Corp. four years ago and now sells the largest number of terminals worldwide. Wyse and Amdek monitors differ mainly in the method by which they are sold. Value-added resellers usually sell Wyse monitors in a package with other components, while dealers generally sell monitors bearing the Amdek name separately.

"A year and a half ago, we restructured our service program to match the way we sell our products," says a spokesman for Wyse. "We sell exclusively to distributors like Micro America and Softsel, who in turn sell to dealers. Our support flow worked the same way. We supported the distributors, the distributors supported the dealers, and the dealers supported the end users. If the end users couldn't get the support they needed, we sold it to them. What we found is that these other layers couldn't give the level of support we needed them to."

Wyse is currently phasing in a new policy that is actually the support policy it used prior to 1989; the new system is scheduled to be in place by the time this issue reaches you. Some of the main features of the new policy are outlined in the

features table. For technical support, there's a toll number (area code 408) for end users and a toll-free number for resellers. During the one-year warranty period, Wyse will allow customers to send its products back to its headquarters. It also offers a network of 700 authorized service centers, including resellers and third-party providers like TRW and Interlogic Trace. Users will be able to call an 800 number to learn which centers are closest.

Obviously, repair service becomes important to most customers only if they have equipment problems, and only 16 percent of the survey respondents with Wyse monitors report having had any problems. This proportion is close to the average for all monitor users.

NOT ALWAYS RELIABLE

The experiences of Kenneth Plotkin, principal scientist at Wyle Laboratories in

Among the small group of respondents who have used such sources as Interlogic Trace and TRW for tech support or repair on Wyse monitors, most rate them abysmal. More frequently, users report turning to the manufacturer or a retailer for these jobs, and their satisfaction with these sources is significantly lower than that of the average monitor user. Though fewer report using direct marketers or in-house departments, those who do are generally more satisfied with these sources of service and support.

According to some respondents, Wyse had service and support problems before it put its 1989 policies into place. Kevin DeMers, an administrative officer for the USDA's Farmers Home Administration headquartered in Louisiana, bought his Amdek 410 monitor three years ago from

A scientist at Wyle Labs in Virginia reports that "the Wyse hot line is easy to get hold of and the people are eager to help. But their answers are not reliable."

Virginia, are typical. Plotkin bought his Wyse monitor as part of a computer system, the way most Wyse monitors are purchased. Through 13 months of monitor use, he reports, "my WY-650 has worked fine." While Plotkin's monitor never gave him any reason to seek technical support, his Wyse video card did. "The Wyse hot line is easy to get hold of, and the people are eager to help, but their answers are not reliable," he says.

If the service is well carried out, it's easy for a monitor user to forget he's even had a problem. Gary Truhn, an instructor at the U.A.W./G.M. Employee Development Center in Pontiac, Michigan, reports virtually no problems with the 22 Amdek 700 monitors that students use there. He says, "Each Amdek withstood approximately 9,000 hours of use at the hands of adult students." He recalls that one monitor actually did break down once, but thanks to the third-party service contract he purchased, he received a loaner while the monitor was in repair, so that he hardly knew it was missing.

Truhn happens to be one of the few respondents to use third-party service. He is also unusual in being pleased with it.

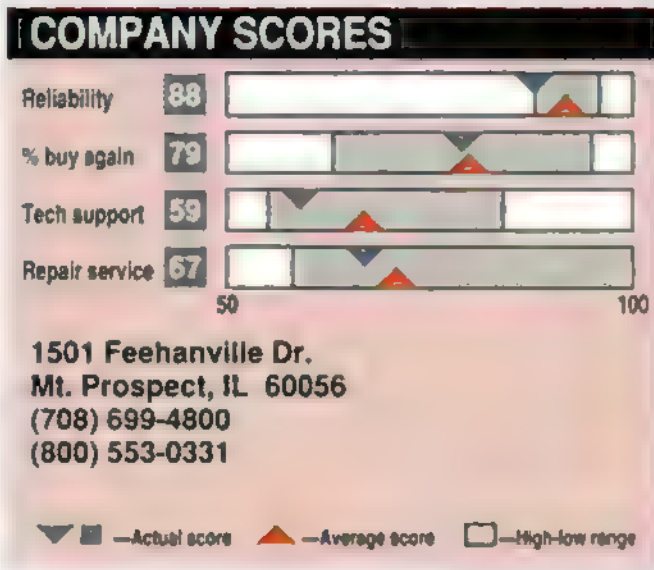
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In all, 74 percent of the Wyse users would buy products from the same manufacturer again—nearly as many as the average for all monitor users. That's respectable, but a company whose monitors consistently perform so well in PC Labs' tests—including two Editor's Choices (the Wyse WY-620, *PC Magazine*, March 25, 1986, and the Wyse WY-700, March 29, 1988)—should be able to do better. We hope that the new policies will improve Wyse Technology's record. Now that Wyse has been acquired by Channel International, a Taiwanese consortium of investment interests, the influx of capital may be helping Wyse restore its service policies.

CIRCLE 668 ON READER SERVICE CARD

Zenith Data Systems

by Emerson A. Torgan



Zenith Electronics Corp., based in Glenview, Illinois, is the only American-owned integrated color television manufacturer. Originally a radio manufacturer in the 1920s, Zenith produced some of the first prototype television receivers in the 1930s and began mass-marketing color television sets in 1961. In 1980, Zenith formed its computer products subsidiary, Zenith Data Systems, in Mt. Prospect, Illinois, then sold it to Groupe Bull Co. of Paris, France, at the close of 1989.

In our Equipment Satisfaction Poll, the 838 respondents with Zenith monitors give the company an average reliability rating of 88—which compares quite respectably with the overall rating of 92 for all monitors combined.

Some of the survey results, however, are visibly less positive. This is not to say that all Zenith monitors are jinxed. 23 percent of the monitors have ever experienced problems; this is 9 points higher than the 14 percent score for all monitors in the survey. And the average level of satisfaction with technical support and repair service for Zenith monitors is somewhat lower than the norm.

These differences are not to be considered a significant reflection on the overall quality of Zenith's monitors when they are functioning. Users are clearly delighted with the stunning pictures that some of the company's displays provide. But when a higher incidence of problems is compounded by lower satisfaction with tech support and repair service (particularly as offered by the manufacturer), unfavorable comments about Zenith begin to make sense.

Joe Cross, an electrical engineer with Beech Aircraft in Wichita, Kansas, says: "Zenith customer support has been er-

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printers
play with
one standard
dot size.

HP makes it a

ASTRONOMY IS LOOKING UP

THE HIRSCH REPORT OF THE SKIES

VOL. 8 NO. 4 FALL 1990

STAR SHORTS

Reported by The Star

Every day billions of dust particles enter into Earth's atmosphere. Now scientists are working to make me-

tearburst communication a practical and economical alternative to the use of tele-

(continued on page 3)

You Can't See the Great Wall from the Moon!

Everyone has heard that you can see the Great Wall of China from the Moon. Or from Earth orbit. Or even from Mars. Certainly you cannot see the Great Wall from the Moon. According to

an astronaut, it's difficult even seeing continents. You may be able to see the Great Wall from orbit, but, in general, it's difficult even to see familiar objects; the planet's swift mo-

(continued on page 3)

Voyager's Last Picture Show

When Voyager 2 was launched 12 years ago, who could have imagined these photos at this point in time.



More on planetary explosions inside.

NO BLACK HOLES?

Scientists are still unable to confirm the existence of even a single black hole, despite widespread belief that such things should exist. Tracking down these invisible objects isn't easy, because they can only be studied indirectly by the effects they have on their surroundings. There are several types of pieces that

(continued on page 3)

MIRROR, MIRROR

It's a chore, but all reflecting telescopes require cleaning their reflective mirrors. Eventually, the aluminum coating on their mirrors deteriorates and needs replacing. For large instruments, the process requires removing the tele-

(continued on page 4)

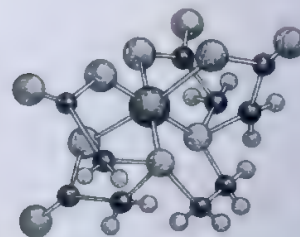
CHAIN REACTION

SCIENCE & COSMIC LETTERS

JUNE 9, 1990

VOLUME FOUR

THREE PAGES



New Leaps in Metal-Organic Chemistry

Metal-organic chemistry bridges the gap between organic and inorganic chemistry. It can lead to important new products (for example, polymer catalysts). A chelate, such as EDTA, above, containing carbon, hydrogen, oxygen and nitrogen atoms can surround ions of metals and remove them from unwanted places. (continued next page)

What's New in Superconductivity?

It was almost exactly three years ago that a ceramic material that superconducts above liquid nitrogen temperature was discovered. Within days, the discovery, electronics, power transmission, and transportation were being redefined in everyone's imagination. Yet superconductivity was not a new phenomenon. The effect was first observed in mercury in 1911, and, since then, more than 6000 elements, alloys, and compounds have been found to superconduct! (continued next page)

Antimatter Bottled

A device tested may give investigators a glimpse of what an antimatter world might look like. The device traps antimatter to a temperature a few degrees above absolute zero and stores it for several days at a time. (continued next page)

Fifty Years Ago

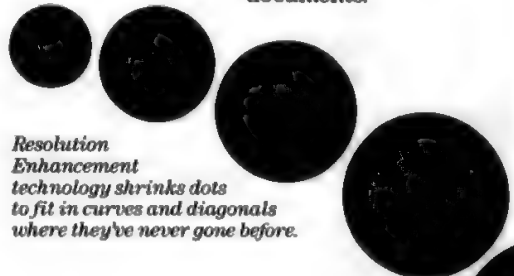
Rumor has it that before WWII, our chemists were experimenting with a distilling process to lower the calories of ordinary beer. Abandoning the research at the onset of world war, researchers then pursued the development of a shelf-stable C ration. Don't believe all rumors.

Introducing the new HP LaserJet III printer with Resolution Enhancement technology.

The rules have changed. Now the name of the game is Resolution Enhancement technology. You'll call it the best thing to happen to laser printing since the very first HP LaserJet printer. It gives you clearer resolution. Curves that really curve. And edges that are never jagged.

Instead of a "one-size-fits-all" dot, HP's built-in intelligence varies dot sizes. So they can fill areas where

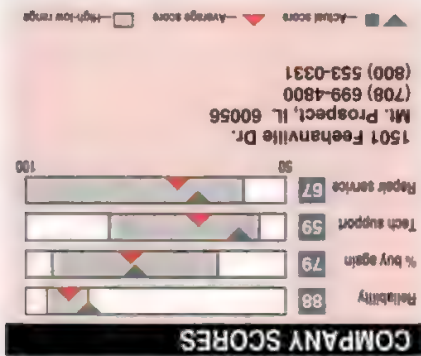
they could never go before. For clearer, more professional-looking documents.



Resolution Enhancement technology shrinks dots to fit in curves and diagonals where they've never gone before.

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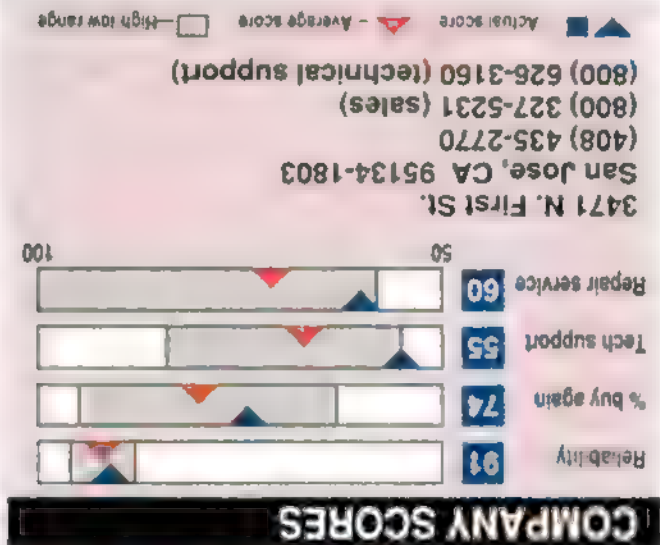
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CIRCLE 667 ON READER SERVICE CARD

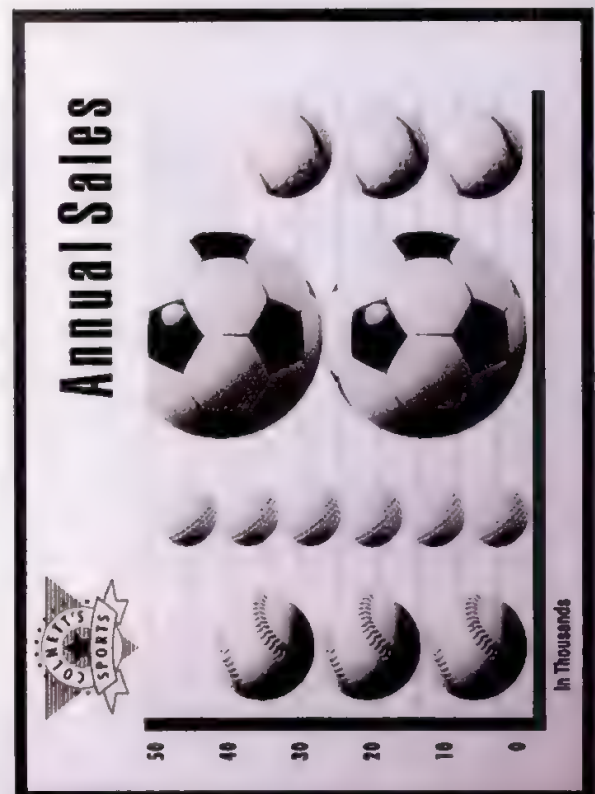
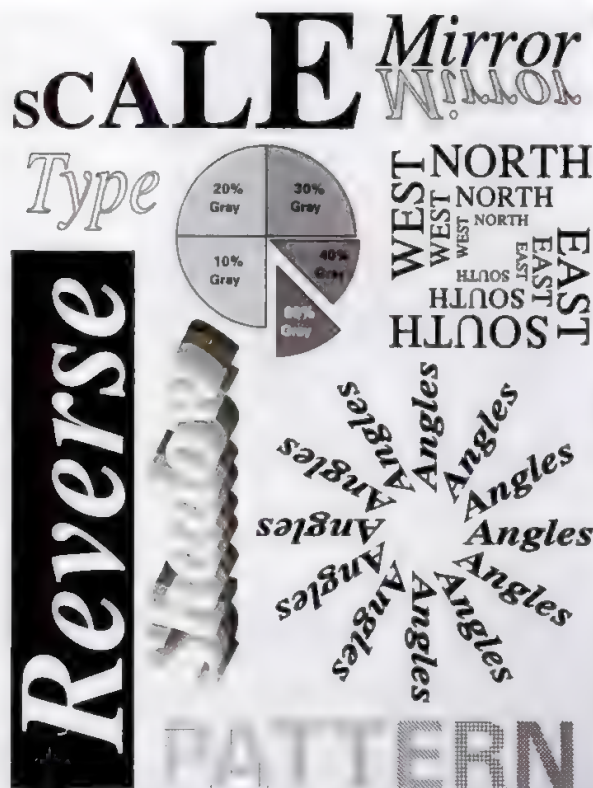
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SEPTEMBER 25, 1990 PC MAGAZINE 275

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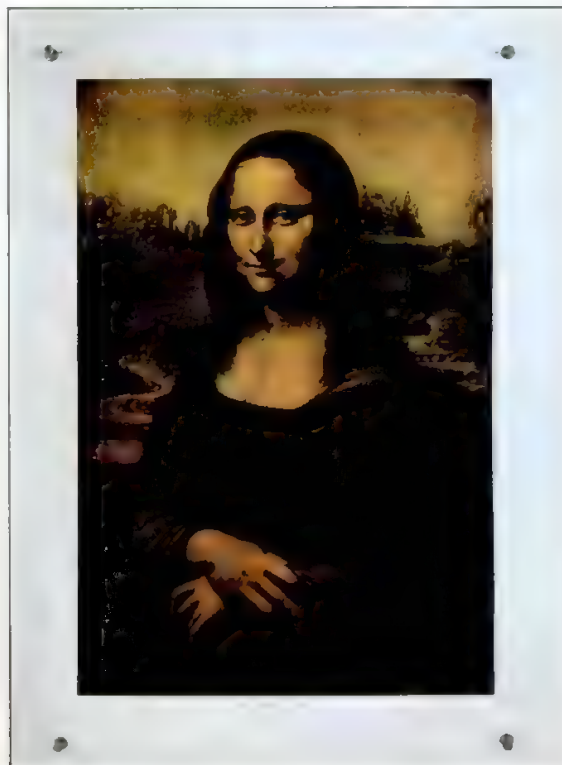
reliability as the rest of the HP printer family.

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CIRCLE 304 ON READER SERVICE CARD

Zenith Data Systems

VGA monitors



Zenith ZCM-1490



matic, ranging from good to nonexistent. The problem with customer support is that in the past, Zenith had a couple of technical support lines you could call. As far as I'm aware, they've done away with that. It's become pretty difficult to contact the company about any technical problems. As far as getting parts, we have a pretty good relationship with the local repair people, but they can't always find replacements for the parts specifically programmed by Zenith. I think a lot of times those parts are being used up by Zenith for production, not for field service."

Most Zenith monitor users do not have access to any genuine technical support by telephone. Zenith offers technical support only to contracted customers and Zenith dealers. End users can dial the toll-free number ((800) 842-9000) only to locate the nearest dealer or service center. The idea is for the users to bring their problems to a dealer, who in turn places the call to the tech-support hot line, which is answered from 8:00 A.M. to 8:00 P.M. Eastern Standard Time. This indirect support is free and unlimited as long as the warranty is in effect. Zenith also offers tech support via a bulletin board service at a yearly rate of \$600 for dealers, \$1,200 for end users. In addition, the company cooperates with the independently operated Zenith Forum on CompuServe.

Zenith gives a one-year warranty on parts and labor, but it does not offer service at the vendor's location. Instead, users can opt for on-site service directly from Zenith Data Systems, from authorized and preferred service centers, and from

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CIRCLE 222 ON READER SERVICE CARD



MONITORS

strategic third-party providers. According to Zenith, the fastest response you could expect when you call for on-site service would be the next business day.

ZENITH VGA MONITORS

The reliability ratings for Zenith VGA monitors come close to the overall average for VGA monitors. Yet user satisfaction with the technical support and repair service, from Zenith and other sources, falls significantly short of the overall average for this group.

Michael Koutnik, an area manager with an industrial automation company in Milwaukee, Wisconsin, tells a story of three and a half months' worth of letters, telephone calls, and paperwork. A "classic bureaucratic nightmare," he calls it. "The new unit works well," he reports, "but has developed some distortion in the width and horizontal size."

The overall problem incidence for Zenith VGA monitors is 25 percent, up over the 19 percent average for VGA monitors overall. Satisfaction with the manufacturer's own VGA repair service gets a rating of 51, a poor showing compared with the average rating of 68.

ZENITH MODEL ZCM-1490

Manufacturing color monitors with its patented flat tension mask (FTM) technology, Zenith produces color displays that provide virtually glare-free viewing. One such monitor, the Zenith Perfect Monitor, Model ZCM-1490, won a *PC Magazine* Award for Technical Excellence and was also judged one of the Best of 1987 (*PC Magazine*, January 12, 1988). "Look in the dictionary under *dazzling*," we said, "and you're likely to see the notation, *syn. Zenith*."

The ZCM-1490 monitor scores close to the overall average for VGA monitors in its reliability rating. A remarkable 87 percent of the respondents claim responsibility for having chosen their Zenith ZCM-1490s; by contrast, only 77 percent of the VGA respondents overall have been in a position to select their monitors by manufacturer and model.

On this basis, it is not surprising that 84 percent of these Zenith respondents said they would buy from the same manufacturer again; this is above the average for VGA monitor manufacturers overall. Says

Peter Chen-See, an MIS technical specialist with Texas Industries Inc. in Dallas, "Wonderful monitor—when it works."

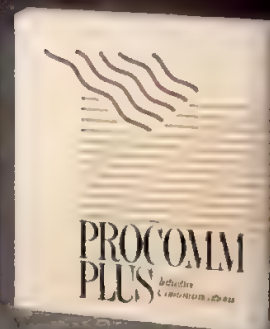
Again, the percentage of units with problems turns out to be higher than average, and the level of user satisfaction with technical support and repair services is significantly below the norm.

"It's a damn shame," says Eric Kok, a business analyst with an electronics manufacturer in Pennsylvania. "The monitors have such a super picture when they work properly. We had 12 ZCM-1490s in our department. Ten developed screen problems within a year. One was dead out of the box. They were all sent in for repair, and when they were returned, they all developed the same problems within the week. Zenith gave us 1492s as replacements." Zenith declined to comment on our findings.

People who work with Zenith monitors every day generally have high praise for the flat tension mask technology and the superior picture quality, but in the eyes of those who needed service or support, Zenith has room for improvement.

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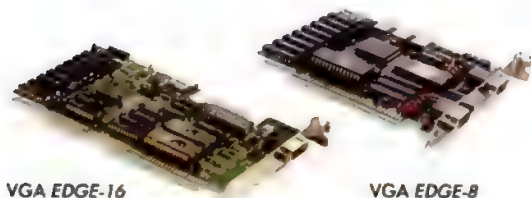
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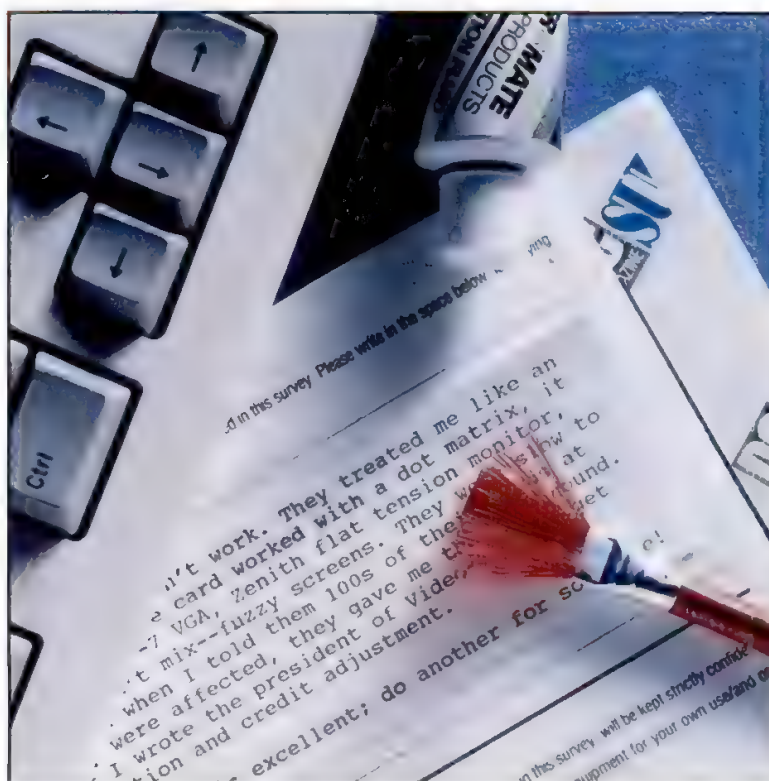
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CIRCLE 540 ON READER SERVICE CARD

Your monitor may be the most noticeable part of your PC, but your graphics adapter does most of the work. Though it's far less expensive than the heavy hunk of metal, plastic, and glass on your desk, it's the determining factor in the video performance of your system. You'll want to make sure that this little board stands up in terms of reliability and service as well as price and performance.

The good news is that graphics adapters, on the whole, are very reliable. Fully 83 percent of the survey respondents



PHOTOGRAPHY: PETER NEUMANN

GRAPHICS ADAPTERS MOSTLY TRUSTWORTHY

who commented on their graphics adapters never had a problem with them. Most people gave their graphics adapters one of the two highest ratings for overall reliability; those who rate them merely average or below are in the range of 5 to 6 percent.

For the most part, the excellent reli-

G

BY
ROCK
MILLER

raphics adapters don't fail very often, but when they do, you'll want to find help at the other end of the phone line. This review of 11 major graphics adapter vendors points up some all-too-common problems—and real differences in the way manufacturers handle them.

bility of graphics adapters stems from their origins: because they're fully electronic, with no moving parts, there's not much to go wrong with them. True, boards can go bad in the manufacturing process or be zapped by static electricity. And the chips can succumb to heat in the long run, especially when operated over long periods in imperfectly ventilated cabinets. But you're a good deal less likely to have difficulties with your graphics adapter than you are with your computer or printer, so when you read our statements about problems, you should keep this perspective firmly in view.

HARD PROBLEMS

Conflicts with existing hardware and software are a fruitful source of difficulties. Though such glitches were usually rated as minor problems by our survey respondents, they can be more of a headache than a simple failure because they can't be fixed by simply replacing the board.

The earliest clones of EGA and VGA cards had their share of direct compatibility problems, but register-level compatibility is a declining issue. Most boards

today are based on a few well-proven chip sets and BIOS designs, and in standard modes and applications they work pretty much as advertised. For extra protection, most vendors offer free BIOS upgrades if you need them.

One hardware problem is becoming more common with the increasing popularity of 16-bit VGA boards. Owing to the design of the AT bus and its protocols for handling 16-bit data transfers, these boards can run into conflicts when they share the bus with 8-bit boards such as scanner interface cards. Most 16-bit video boards automatically switch into 8-bit mode if

HEAD TO HEAD: COMPANIES COMPETE ON SERVICE AND RELIABILITY

Graphics adapters are very reliable. Though problem incidences and other indicators of reliability do vary between companies, mean reliability ratings show insignificant differences.

The same cannot be said of technical support and repair service, where wider disparities are evident. Hercules Computer Technology takes the prize on both counts, with an exceptionally high satisfaction rating for its technical support. By contrast, STB Systems clearly fares worst in the lineup, with the lowest scores on both measures. Repair service ratings show fewer distinctions than technical support ratings, but it's notable that Genoa Systems, whose product line is troubled by some problem boards, does almost as well as Hercules on satisfaction with repair service.

Which offers better support, the manufacturer or the dealer? Looking at the low satisfaction ratings garnered by Everex Systems and AST Research might lead one to think the former,

but that's not an inevitable rule. Both Renaissance GRX and IBM, which also rely heavily on dealers, do well enough. The secret may lie in the type of dealers we're talking about. Many IBM and Renaissance dealers are full-service organizations, while there are few requirements for AST and Everex dealers.

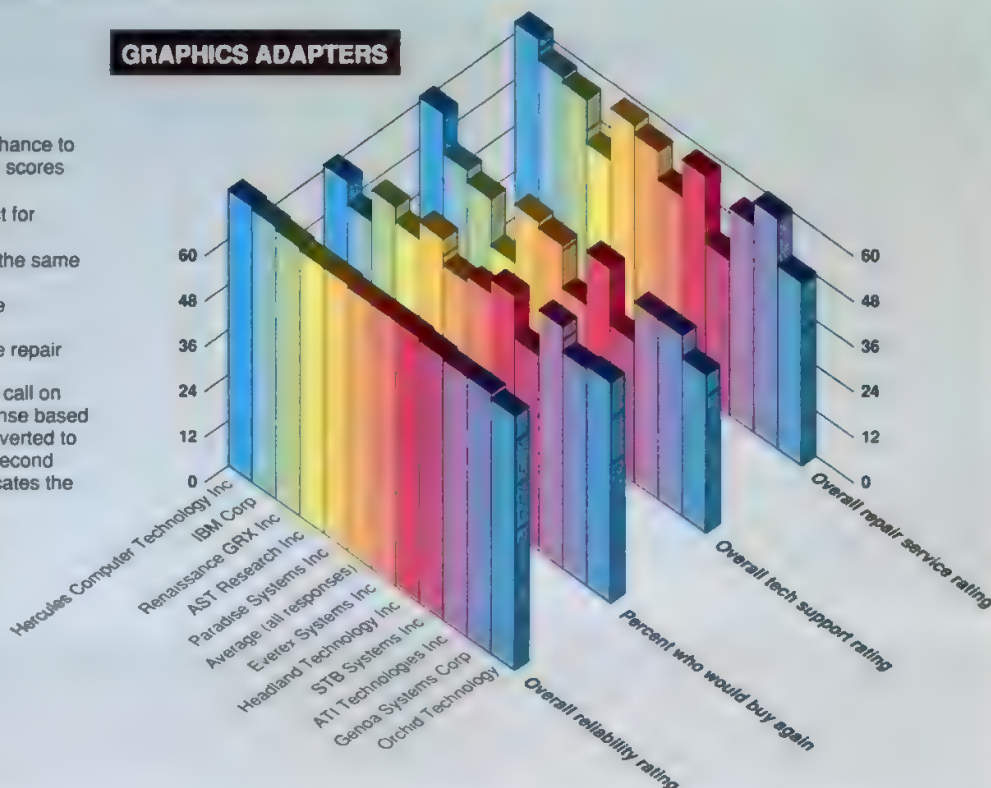
When it comes to buying again from the same manufacturer, market leaders Paradise Systems, ATI Technologies, and Headland Technology—plus up-and-coming Renaissance GRX—all do somewhat better than average, though an inspection of the reviews will show real differences between them. Trailing behind are Genoa, Orchid Technology, and STB Systems, probably because of reliability and tech support difficulties. Despite its stellar reliability ratings, IBM also has relatively low ratings in this area: the generally high prices for its products seem to be the reason.

GRAPHICS ADAPTERS

This 3-D bar chart gives you the chance to compare at a glance the company scores for four questions:

- How would you rate the product for overall reliability?
- Would you buy a product from the same manufacturer again?
- How satisfied were you with the technical support you received?
- How satisfied were you with the repair service you received?

The first question and the last two call on respondents to give a rated response based on a scale of 1 to 5, which we converted to a more familiar 1 to 100. For the second question, though, each result indicates the percentage of respondents who answer yes. Note that answers to the first two questions come from all those responding for a given company or product. For the last two questions, however, those answering are a subset of the total respondents—only those persons who tried tech support or had a repair problem.



GRAPHICS ADAPTERS

they detect any other boards located in the crucial C000-DFFF memory segment, causing nothing worse than a loss of performance. Sometimes, however, you'll have to set DIP switches to force the card into 8-bit mode (see the PC Lab Notes "Facing the Truth About 16-bit VGA Adapters" in this issue).

DRIVERS DOMINATE

Yet even as hardware compatibilities have been mostly ironed out, a wildcard has been introduced in the form of imperfectly standardized extended VGA modes.

problem that may lie in your software, computer, monitor, or graphics adapter. And if your graphics adapter fails outright, many mail-order vendors can send you a new board overnight, which board manufacturers often won't do until they've received your board and assessed the prospects of repairing it.

But systems vendors can't solve problems that require BIOS or driver updates, and manufacturers with good, solid support programs do far better in users' esti-

tionate number of calls, manufacturers are making great efforts to find better ways to get updates out to users. Electronic bulletin boards are a useful option for many people (see the sidebar "Help by Modem: Electronic Bulletin Boards"). Unlike technical support lines, electronic bulletin boards are open 24 hours a day, though busy signals can be a problem on bulletin boards too. Still, if you're willing to pay the price of a long-distance telephone call, you can download the drivers you need right away instead of waiting a week for a floppy disk to arrive. Updated drivers are often also posted on user-group bulletin boards and on public forums such as CompuServe, and most manufacturers encourage their dealers to spread the latest software around to their customers.

TURNAROUND BLUES

When a graphics adapter fails, it usually fails completely. It's rarely practical to replace chip-level components, and it's rarely worthwhile to replace connectors or other discrete parts on the boards. The best remedy is usually to replace the board, a fairly easy job that even relative novices can accomplish once the problem is diagnosed.

But getting a replacement board under warranty can be a problem with some vendors, as our reviews indicate. And in any case, unless you can borrow a graphics board temporarily or arrange with a sympathetic dealer to swap boards, be prepared to have your system out of commission for a while. The best manufacturers promise a 48-hour turnaround, so with overnight shipping, repair should normally take no more than a week. Unfortunately, longer waits are all too common and are a frequent source of user complaints.

The graphics adapter business is a competitive one, with hot rivalry among the leaders—Headland Technology/Video Seven, Paradise Systems, and ATI Technologies—and plenty of choices among the lesser players. This is in itself a certain assurance of quality: though some of the vendors have shown uneven performance here and there, you won't go outrageously wrong with most of them. Yet there are real differences in support and reliability as well as in price and performance between the vendors. If service and support are important considerations to you, it's worth the trouble to shop around.

**Though a knowledgeable dealer
can be more convenient than any manufacturer,
smart users will make sure
they can deal direct
if they need to.**

Though 800 by 600 or 1,024 by 768 graphics modes can give real precision to your CAD software and *Windows* applications, each manufacturer supports its extended resolutions differently. This means that users of extended VGA modes are at the mercy of their graphics board manufacturers for driver updates. Not surprisingly, drivers account for a large share of support calls and compatibility problems, as technical support managers will confirm. And some of the bitterest complaints in our survey are prompted by failures to keep drivers up to date.

Emerging standards such as those promoted by the Video Equipment Standards Association (VESA) and the growth of device-independent environments such as *Microsoft Windows* may make driver updates easier in the future. In the meantime, if you intend to make use of extended graphics resolutions, the ability of the manufacturer to deliver high-quality, bug-free drivers in a timely fashion should be one of your most important considerations.

ONE-STOP SUPPORT

When you have a problem with your graphics adapter, how should you go about getting it fixed? The first answer may be to go to your computer manufacturer. While you can run into the problem of finger-pointing, your systems vendor is often in the best position to sort out a

mation than those who use dealers as middlemen. The worst satisfaction ratings for technical support, in fact, are racked up by two vendors who rely exclusively or mostly on dealers for service and support: AST Research and Everex Systems. Though a knowledgeable dealer can be more convenient than any manufacturer, smart users will make sure they can deal direct if they need to. In fact, most of our survey respondents who have had problems went to the manufacturer for tech support and repair.

THEORY AND PRACTICE

Among manufacturers, generous support policies are the rule. Most offer good warranties; for example, Paradise offers a three-year warranty, and Headland Technology, the maker of Video Seven cards, guarantees them for seven years. All offer free, unlimited technical support, in or out of warranty, and all will provide free software and BIOS updates upon request.

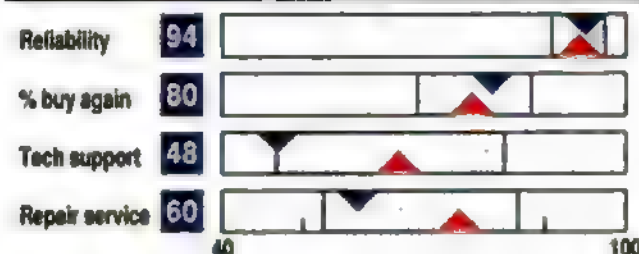
But this rosy vision is tempered in reality by clogged technical-support lines, backlogged repair centers, and surly or ignorant support personnel. The results reflect this: though people think highly of their graphics adapters (with an average reliability score of 93), they are less happy with technical support (average satisfaction rating of 66) and repair service (average satisfaction rating of 75).

Since drivers account for a dispropor-

AST Research Inc.

by Carol Levin

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Actual score Average score High-low range

AST Research is a well-established board and systems vendor with a good reputation. In ten years, the company has developed a marketing strategy based on distributors, retailers, and independent authorized resellers and has grown to support its products through some 1,200 authorized service centers. Yet though AST's major corporate customers—General Motors, the Kennedy Center for the Performing Arts, and Hughes Aircraft—can benefit from the company's Premium Support Programs, some end users seem to get lost in the fray. While AST users in our survey report that their graphics boards are reliable equipment, the company badly trails most of its competitors in tech support and service.

The company scores 94 in reliability, one of the better scores. Only 8 percent of those using AST's VGA and VGA Plus boards report ever having had a problem, compared with 14 percent of the VGA users in the survey. The severity rating of typical problems for AST's entire line of graphics boards falls safely within the average range, and among VGA boards its problems were rated somewhat less serious than average.

ON THE BALL

But AST fares poorly in satisfaction ratings for tech support (48) and repair service (60), well below the averages of 66 and 75, respectively. This seems uncharacteristic, given AST's elaborate service and support setup. AST dedicates one in ten employees to a vast post-sales support program. At AST headquarters in Irvine, California, 35 telephone tech-support people handle 1,500 calls from end users and 400 calls on the toll-free dealer hot line every day. "One half of one percent of all calls escalate into the engineering

SERVICE AND RELIABILITY GRAPHICS ADAPTERS

group that developed the product within 96 hours," says Jim Schraith, vice president of worldwide reseller and customer service at AST.

As far as service through dealers goes, "AST is very active in monitoring the service quality we deliver ourselves and through the dealer channel," says Schraith. AST even offers video courses to teach resellers how to maintain and configure their products. "This migration to video training is part of our philosophy to ensure more trained technicians in the reseller channel than through hands-on training," he says. The results are good, he claims: "Of the 1,000 end users AST surveys each month, an overwhelming majority say they are happy and would go back to their dealer for support."

A growing focus of AST's service is to recognize that large end users are becoming maintenance providers themselves. "We've found that large corporate cus-

VGA Adapters



Actual score Average score High-low range

tomers have developed a large enough in-house support staff and a high enough technical adeptness level to be treated in a higher-end service program," says Schraith. Our survey seems to indicate that the highest satisfaction levels are with in-house departments.

lie about when the systems will be ready," Rivera says. "The 'authorized' service people do not really work for AST. A lot of them just downright lie to you." She says she contacted AST directly but had to complain profusely to get the company to move. The AST people were good, she reports, but they had to get on the dealer's case to get some action. "Result—now I buy Northgate," Rivera says.

AST's Schraith responds that this weakness in tech support is common to many companies with an extensive distribution network such as the one AST has. "A large portion of graphics board

A growing focus of AST's service is to recognize that large end users are becoming maintenance providers themselves.

PURCHASER'S RESPONSIBILITY

Clearly, AST tries to run a tight ship when it comes to tech support and service. So why do survey respondents express such relatively low satisfaction with it? Christine Rivera, president of Micro Dynamics Plus, a New York computer training firm, gives an idea of what the answer might be. She was very disappointed with the tech support she received from three separate AST authorized service centers when her 8-bit VGA card needed replacement, and her opinion indicates why many consumers prefer to deal directly with manufacturers on such products.

"They take about one week just to look at it; they do not stock parts; and they

resellers are not authorized by AST. Someone who only sells the graphics board may not be delivering the same level of service as our people, and we do not have control over the quality of service that some dealers use." To avoid disappointment, he recommends that you first check out the dealer to see if he meets the level of service that you expect. "AST can steer callers to Preferred Board Resellers who do volume business and have made a commitment to AST graphics and enhancement boards," he says.

GREAT EXPECTATIONS

This wayward element in an otherwise comprehensive tech-support program does not seem to weaken the bottom line. AST seems to have a fairly loyal following for its graphics boards, with 80 percent of the respondents saying they would buy from AST again. Yet AST's organization clearly does not work as well for graphics boards as it does for its systems as a whole.

CIRCLE 406 ON READER SERVICE CARD

ATI Technologies Inc.

by Carol Levin

SERVICE AND RELIABILITY GRAPHICS ADAPTERS

COMPANY SCORES



3761 Victoria Park Ave.
Scarborough, Ontario, M1W 3S2 Canada
(416) 756-0718
(416) 756-0711 (technical support)

■ Actual score ▲ Average score □ High-low range

ATI Technologies receives very good ratings from most of our survey respondents. The Ontario-based company manufactures a line of graphics and communications enhancement products sold through OEMs and distributors. Since 1985, ATI has introduced eight graphics boards, and its VGA Wonder (recipient of *PC Magazine's* Editor's Choice in 1989) and EGA Wonder boards are among the most popular in their categories.

Users like Bill Hitefield, senior system programmer at The Stanley Works in Plainville, Connecticut, have nothing but rave reviews for the ATI VGA Wonder graphics adapter. "It's very fast, and so far, I haven't run into a single program I haven't been able to run. The one time I called tech support about a parity error in the debug utility, I got someone the first time I called," he says.

Looking at the numbers, ATI's VGA and EGA models appear to score slightly worse than average in terms of reliability, with an overall reliability rating of 91 and

problem incidences of 17 percent and 15 percent, respectively. But this difference is not enough to indicate a serious reliability problem. A somewhat larger number of people than average say that problems with the EGA Wonder board have led to impairment or unusability in the past year, and more rate the problems they have experienced with the EGA Wonder board as severe.

The transition from CGA to EGA boards can be rocky for end users, explains ATI's Rick Osborne. "The problem with EGA is just understanding what the specification needs. EGA doesn't fully encompass the CGA standard. As a result, people are running CGA software on EGA boards, and in some cases it doesn't work.

"The ATI VGA Wonder card is a reliable piece of equipment. But the manufacturer's tech service line is always busy."

With the EGA Wonder we made some specific BIOS routines that would allow more CGA software to run on our product and would make EGA work better," Osborne says.

CONSTANT BUSY SIGNAL

ATI fares less well when it comes to service and support. ATI's technical support line, located at headquarters in Canada, is not toll-free, and it is a major source of dissatisfaction among the company's users. Though the company's overall score for tech support is comparable to other manufacturers' scores, ATI's tech-support hot line scores somewhat lower than average, and somewhat more than the average number of users are not satisfied at all. It's not hard to find out why.

After six hours of constant redialing to ATI tech support, William Hoffman, a researcher in the psychiatry service at the Portland VA Medical Center in Oregon, gave up. He wrote two letters, faxed one request for help, and rated ATI tech support poor in our survey. "The ATI VGA Wonder card is a reliable piece of equipment. But the manufacturer's tech service line is always busy. I am not happy with this lack of responsiveness," Hoffman says. Others tell similar stories. G. A. Patchett of Greenwich, Connecticut, had

a simple technical question about interrupt conflicts. He was put on hold, long distance to Canada, for 65 minutes. "I never got through," he says. "I gave up before I went bankrupt."

EXPANDING PRESENCE

Respondents don't think all that much of ATI's repair service, either. Landon Scism, public school computer coordinator in Northampton County, North Carolina, returned his graphics board to ATI after it failed on a new installation. "I was told it would be about a two-week turnaround. Three weeks later, the technical service department told me I'd receive it by the end of the week. This happened two more times from November 1989 until January 1990," Scism says. He then called the vice president of customer relations,

complained, and received a new board three days later.

ATI's Osborne explains that the company is trying to create stronger ties with resellers and distributors to strengthen its end-user orientation. "Our philosophy is to conquer what we're doing now and then build on it. We want to make sure that what we're now doing is right." ATI is setting up new dealer and distributor programs—ready for full implementation this fall—and investigating a true customer service department to give end users a wider scope of support.

Right now, users can contact ATI by phone or fax, and a bulletin board service provides documentation, utilities, and new drivers. For the last three years, ATI has been doing a fair amount of tech support by fax. Osborne says that tech support will respond the same day. Other tech-support programs include free software and BIOS updates. VGA Wonder users can get free BIOS chips that will support different monitors.

ATI users are more confident than most about their graphics board selection. 85 percent say they would buy again from ATI, a good showing in a range from 69 percent to 86 percent. Most graphics board users are knowledgeable about their computers and, like Bill Hitefield, have

ATI Technologies Inc.

VGA Wonder



EGA Wonder



▼ Actual score ▲ Average score □ High-low range

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Mary Flynn, PC-Magazine, The Best of 1989



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CIRCLE 212 ON READER SERVICE CARD

SERVICE AND RELIABILITY GRAPHICS ADAPTERS

high expectations for both performance and reliability. "I did a lot of research into the components before I purchased them," Hitefield says. Overall, he's very pleased with his ATI graphics board.

CIRCLE 407 ON READER SERVICE CARD

Everex Systems Inc.

by Carol Levin

COMPANY SCORES



48431 Milmont Dr.
Fremont, CA 94538
(415) 498-1111
(415) 498-1115 (technical support)
(800) 821-0806 (sales)

■ Actual score ▲ Average score ■ High-low range

Though Everex Systems' graphics boards are head-to-head with the competition in reliability, this well-known maker of system units and peripherals falls notably short in the quality of the support it is able to deliver to its graphics board users, especially those using non-Everex systems. This information comes from the 467 Everex graphics board customers who have responded to our survey.

In reliability, the company's products attract average responses. It scores 93 in reliability, and about three-quarters of the respondents on both VGA and EGA cards rate their system in the most reliable category, again comparable with their competitors in their respective categories. According to Everex's Robert Hayes, "The EGA board is pretty much plug-and-play, though the VGA cards tend to have more complications because they have more options, support more monitors, and have extended modes."

THE DEALERS

Everex supports users both through dealers and through its own facilities in Fremont, California, which contain a group dedicated to technical support of its graphics products. Though the company is selective with its systems dealers—who must file an application, complete a two-day training course, and stock a minimum number of units—the only requirements for becoming an Everex graphics board dealer are a business license and a brief

application. "We will sell video cards to most dealers," says Hayes. In this respect, users of Everex graphics boards in non-Everex systems may not be receiving equality of support. The results do not look good: respondents rate the company well below average for technical support and repair service alike.

These low ratings may reflect the frustration of respondents who expected a level of support from resellers who didn't deliver. "I will never buy anything that the manufacturer won't support. It's a rule I live by," says Christopher Rodgers, a computer specialist with the Army at Aberdeen Proving Ground in Maryland. "I bought a clone system with an EGA board through a dealer and was told time and time again by Everex that it would not give direct support." When his diagnostic software reported parity errors, he had to go through the dealer. "As usual, the dealer's technical knowledge was not sufficient," he says.

Everex's Robert Hayes disagrees. "We support a large number of end users on peripheral products." While it may be harder to get field service on a graphics board alone, he says, graphics board users are free to contact Everex directly.

Fortunately, the manufacturer isn't your only option. "It is repair time that affects how I view a product," says Dean Upshaw, an architect in Indiana. He could not be more satisfied with the service he received on his Everex graphics board—but then he got it from Gateway 2000, his systems vendor. "It was replaced by Gateway overnight with no downtime at all," he says.

TELEPHONE SUPPORT

Everex has an extensive tech support staff covering the phones, and respondents are about as satisfied with Everex's hot line as they are with those of its competitors. They have the usual array of problems to report. Chuck Young, a lab manager with an engineering firm in Nevada, for instance, had problems with two Everex graphics boards and was disappointed with



NUMBERS YOU CAN TRUST: HOW MUCH IS ENOUGH?

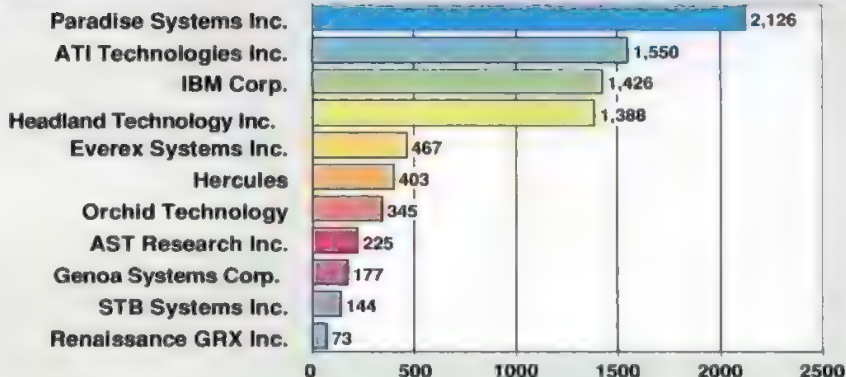
Three manufacturers account for the bulk of the responses: Paradise Systems, ATI Technologies, and Headland Technology (the makers of Video Seven graphics boards). A large number are also for IBM, although many of its boards are the built-in VGA adapters that come with the PS/2.

This chart displays the number of responses each manufacturer of graphics adapters received in our March 27 Service and Reliability Survey. In this issue, we review manufacturers that garnered 75 or more survey responses, the minimum number required for the results to be reliable. Where companies of special interest with fewer than 75 responses are reviewed, their ratings should be used with caution because of the small base sizes.

RESPONDENT BASE

GRAPHICS ADAPTER MANUFACTURERS

NUMBER OF RESPONSES PER COMPANY



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Products listed here in red work under Microsoft Windows.

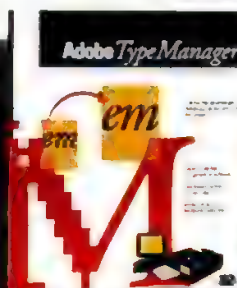
- Adobe Systems ... NCP**
- 6591 ☐Illustrator Windows 1.0. \$279.
 - 7547 ☐Adobe Type Manager for Windows. 59.
 - 6590 ☐Streamline Windows 1.0. 229.
 - 7392 ☐Adobe PostScript Cartridge. 249.
- (Entire Adobe Type Library, from 1 to 133 is available. Call for more information.)
- Aldus ... NCP**
- 1332 ☐PageMaker 3.01. 499.
- Alpha Software ... NCP**
- 5104 ☐Alpha Four 1.1. 319.
- Application Techniques ... NCP**
- 1214 ☐Pizazz Plus 2.0. 69.
- Ashton-Tate ... NCP**
- 4450 ☐dBASE IV 1.0. 499.
- Asymetrix ... NCP**
- 7384 ☐Toolbook 1.0 for Windows. 309.
- Autodesk ... NCP**
- 4519 ☐Autosketch 2.0. 95.
- Avery ... NCP**
- 6006 ☐Label Pro 1.0. 49.
 - 7336 ☐Label Pro 1.0 for Dot Matrix. 49.



Alpha Software ... NCP

5104 ☐Alpha Four 1.1—The award-winning, fully relational database management & application development system for business people, not programmers. Offers sophisticated reports and customized applications ... \$319.

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Before Adobe Type Manager:

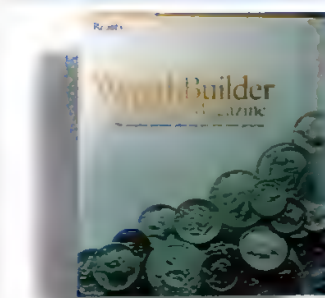


After Adobe Type Manager:

Adobe Systems ... NCP

7547 ☐Adobe Type Manager for Windows—Adobe Type Manager software from Adobe Systems really does Windows. The program automatically cleans up the jagged or stick figure type displayed on your screen, as well as text printed from dot matrix printers. It comes with 13 scalable font programs and enables you to use other high-quality PostScript language typefaces, even if you don't have a PostScript printer. \$59.

- Bitstream ... NCP**
- ⓂCollections: Newsletters, Flyers, Books & Manuals, Reports and Proposals, Presentations or Spreadsheets each 159.
 - ⓂFontware. each 99.
- Borland International ... NCP**
- 7346 ☐Turbo C++ 1.0. introductory price 95.
 - 7356 ☐Turbo Pascal Professional 2nd Ed. . 179.
 - 6242 ☐Quattro Pro 1.0. 325.
 - 1514 ☐Paradox 3.0. 469.
- Brightbill-Roberts ... NCP**
- 5408 ☐Hyperpad 2.0. 85.
- Broderbund ... CP**
- 1434 ☐New Print Shop (NCP). 39.
- From Access Softtek
- 7288 ☐Prompt 1.0 for Windows. 79.
 - 7289 ☐Dragnet 1.0 for Windows. 89.
- ButtonWare ... NCP**
- 6419 ☐PC-File 5.0. 75.
- Caere ... NCP**
- 6004 ☐OmniPage 386 2.1. 599.
- Central Point ... NCP**
- 5039 ☐PC Tools Deluxe 6.0. 89.
 - 5038 ☐Copy II PC 5.0. 27.
- Chronos Software ... NCP**
- 4387 ☐Who's What/When 2.0. 179.
- Concentric Data Systems ... NCP**
- 6575 ☐R & R Relational Report Writer 3B 109.
- Corel Systems ... NCP**
- 5506 ☐CorelDRAW! 1.2. 329.
- Crosstalk Communications ... NCP**
- 2908 ☐Crosstalk XVI 3.71. 119.
 - 5611 ☐Crosstalk for Windows 1.0. 129.
- Custom Applications ... NCP**
- 7474 ☐Freedom of Press 2.2. 255.
- Data Storm ... NCP**
- 4798 ☐PROCOMM PLUS 1.1. 65.
- Delrina Technology ... NCP**
- 4325 ☐PerFORM 2.1 (\$30 rebate!) . . . 159.
 - 7351 ☐PerFORMPRO 1.0 for Windows. 299.
- Delta Technology ... NCP**
- 5829 ☐Direct Access 5.0. 55.
- Digital Composition Systems ... NCP**
- 6799 ☐db Publisher 1.0 for Ventura. 149.
- Dow Jones ... NCP**
- 5494 ☐News/Retrieval Membership Pkg. 24.
- 5th Generation ... NCP**
- 5504 ☐Brooklyn Bridge 3.0. 79.
 - 2762 ☐Mace Utilities 1990. 99.
 - 3950 ☐Fastback Plus 2.1. 119.
- FNN Data Broadcasting**
- 7005 ☐NewsReal 1.0. 99.
- FormWorx ... NCP**
- 5810 ☐FormWorx with Fill & File 2.5. 85.
- Form Publisher for Windows 1.2. 145.**
- Fox Software ... NCP**
- 6188 ☐FoxPro 1.02. 489.
- Franklin Software ... NCP**
- 7071 ☐Language Master 2.0. 59.
 - 7416 ☐Language Master 3.0 for Windows 59.
- Funk Software ... NCP**
- 2228 ☐Sideways 3.21. 42.
 - 7380 ☐P.D. Queue 1.0 (print spooler) . . 55.
- Generic Software ... NCP**
- 2265 ☐Generic CADD Level 3 1.1.3. 225.



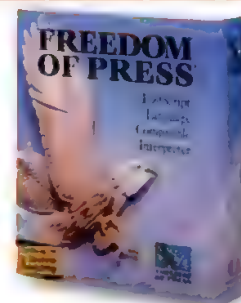
Reality Technologies ... NCP

6572 ☐WealthBuilder by Money Magazine 1.1—Save & invest wisely. Set financial goals & achieve them. Plan for retirement, a child's education, a home. Optimize your portfolio & track all of your investments. \$145.

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Great American Software ... NCP	
4880	□One Write Plus Acct. Sys. 2.06 . . . \$179.
5825	②Money Matters 1.0. 55.
Harvard Associates ... NCP	
2324	②PC Logo 3.0 59.
hDC Computer Corp. ... NCP	
7389	②Windows Express 3.0 55.
7383	②First Apps 1.0 55.
Hilgraeve ... NCP	
2323	②HyperACCESS 5.1.1 (DOS & OS/2) 115.
IBM ... NCP	
6599	□Current 1.1 239.
Individual Software ... NCP	
6222	②Resume Maker 1.1 29.
Inset Systems ... NCP	
7298	②Hijaak 1.1 85.
7300	②Inset Plus Hijaak 99.
Intult ... NCP	
2426	②Quicken 3.0 39.
Isogon ... NCP	
7478	□FontSpace 1.16 59.
LaserTools ... NCP	
6882	②PrintCache 2.3 99.
Lord Publishing ... NCP	
5191	②Ronstadt's Financials 1.02 75.
Lotus ... NCP	
5417	□1-2-3 3.0 call
5653	□1-2-3 2.2 349.
5134	②Magellan 2.0 119.
MECA ... NCP	
2798	②Managing Your Money 6.0 119.
7002	②Home Lawyer 1.0 69.
Microcom ... NCP	
6234	□CarbonCopy Plus 5.2 119.
7024	□CarbonCopy Plus+ Host 5.2 . . . 199.
Micrografx ... NCP	
6597	□Designer 3.01 489.
Micro Logic ... NCP	
6787	②Info Select 1.1 55.
Microlytics ... NCP	
2731	□GOfer 2.0 45.
Microsoft ... NCP	
7010	□Windows 3.0 99.
7388	②Project for Windows 1.0 469.

7387	②PowerPoint for Windows 1.0 . . . \$329.
2904	□Works 2.0 99.
2901	□Word 5.0 209.
6195	②Word for Windows 1.0 329.
2856	②Excel 2.1 call
2894	□QuickBASIC 4.5 69.
2895	□QuickC 2.0 69.
2853	②C Compiler 6.0 339.
Multisoft ... NCP	
4925	□PC-Kwik Power Pak 1.5 79.
Nolo Press ... NCP	
2982	□WillMaker 3.0 35.
Norton-Lambert ... NCP	
4928	□Close-Up Customer 3.0 135.
4929	□Close-Up Support 3.0 165.
PC Globe ... NCP	
5902	□PC Globe 3.0 39.
5900	□PC USA 1.0 39.
Personics ... NCP	
4384	②Ultrasound 2.0 79.
7048	②Monarch 1.0 (Data Mgmt. Tool) . 319.



Custom Applications ... NCP
 7474 □Freedom of Press 2.2—Print PostScript language files from your PC to over 50 non-PostScript printers. Comes with 35 scalable PostScript fonts and works with any application that can produce PostScript files . \$255.



Microcom ... NCP
 7024 □CarbonCopy Plus+ Host 5.2—Control or monitor a remote PC from your PC using standard dial-up modems. Get both controller and client software in one package . \$199.

Reference Software ... NCP	
4398	②Grammatik IV 1.0 52.
7483	②Grammatik Windows 1.0 52.
Revolution Software ... NCP	
4480	②VGA Dimmer 2.01 (screen saver) . 19.
RightSoft ... NCP	
4155	②RightWriter 3.1 54.
Samms ... NCP	
5799	②Ami Professional 1.2 309.
Softlogic Solutions ... NCP	
3542	□Software Carousel 4.0 55.
Software Publishing ... NCP	
3499	□PFS:First Publisher 3.0 99.
3478	□PFS:First Choice 3.02 105.
3496	□Professional Write 2.2 165.
3482	□Harvard Graphics 2.3 339.
Symantec ... NCP	
3425	□Q&A 3.0 229.
3431	□Timeline 4.0 469.
Systems Compatibility ... NCP	
6564	□Software Bridge 4.1 79.

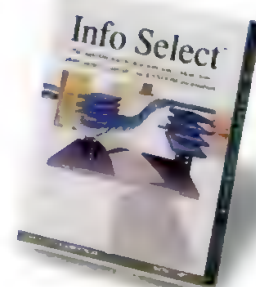


Microsoft ... NCP
 7010 □Windows 3.0—It's what the GUI ("gooie") gurus have been waiting for. The latest in Graphical User Interface for MS-DOS machines. Lets each application access much more memory and do it faster . \$99.

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Precision Software ... NCP	
6600	②Superbase 4 for Windows 1.2 . . 429.
Qualitas ... NCP	
7539	□386MAX 5.0 75.
Quarterdeck ... NCP	
6422	□QRAM 1.0 49.
3221	□Expanded Memory Mgr. 386 5.1 . 59.
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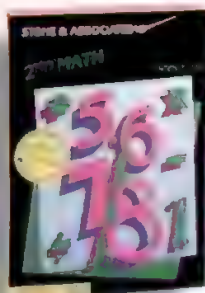
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4155 ☐ Right Writer 3.1—Make your business writing clear, concise and powerful. Award winning Right Writer checks your grammar, style, word usage and punctuation. Works with most popular word processors. . . \$54.

TIMESLIPS ... NCP		
2987	☐ Timeslips III 3.4	169.
6994	☐ PercentEdge 1.0	69.
Timeworks ... NCP		
6253	☐ Publish-It! 1.1	115.
TOPS ... NCP		
6675	☐ TOPS Network Bundle 3.0	159.
3720	Flashcard 2.1 (AppleTalk network card; 1 year warranty)	155.
Touchstone Software ... NCP		
7420	☐ Check It 2.1	89.
Traveling Software ... NCP		
4190	Battery Watch 2.0 (3 1/2" only)	35.
5179	☐ LapLink III 3.0	95.
True BASIC ... NCP		
3561	☐ True BASIC 2.1	52.
Vericom ... NCP		
6771	☐ Memory Master 1.0	45.
WordPerfect Corp. ... NCP		
3804	☐ WordPerfect 5.1	265.
6685	☐ DrawPerfect 1.1	279.



Stone & Associates ... NCP

3439 ☐ 2nd Math—WILL YOUR CHILD COMPETE...at the college of your choice? Excellent math skills equal academic success! 2nd Math teaches basic math skills, fractions—even pre-algebra. . . \$27.

WordStar International ... NCP

6791	☐ WordStar Prof. 6.0	\$279.
Xerox ... NCP		
3812	☐ Ventura Publisher Gold 3.0	559.
XTREE ... NCP		
6161	☐ XTreePro Gold 1.4	75.
ZSoft ... NCP		
7016	☐ PC Paintbrush IV Plus 1.0	119.

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Broderbund ... CP		
5701	☐ Where/Time Carmen Sandiego?	32.
6295	☐ The Playroom	32.
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Electronic Arts ... NCP		
5804	☐ Deluxe Paint II (Enhanced)	89.
Microsoft ... NCP		
2858	☐ Flight Simulator 4.0	39.
Penton Overseas ... NCP		
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7539 ☐ 386MAX 5.0—Powerful new MAXIMIZE feature finds and uses all the memory you paid for. Automatic install makes this industry standard memory manager indispensable for all level of 386 users. \$75.

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6023	☐ Leisure Suit Larry III	39.
6796	☐ Codename: Iceman	39.
6972	☐ Conquests of Camelot	39.
Software Toolworks ... NCP		
6436	☐ Hunt for Red October	20.
4659	☐ Chessmaster 2100 (CP)	35.
Stone & Assoc. ... NCP		
3438	☐ Young Math (ages 5 to 8)	22.
3439	☐ 2nd Math (ages 7 to 16)	27.
True BASIC, Inc. ... NCP		
	☐ Kemeny/Kurtz Math Series:	
	10 titles	each 45.

HARDWARE

Manufacturer's standard limited warranty period for items shown is listed after each company name. Some products in their line may have different warranty periods.



Corel Systems ... NCP

5506 ☐ CorelDRAW! 1.2—The world's leading PC illustration software now comes with even more value: CorelTRACE, over 100 typefaces, over 300 clip-art images, a Pantone license—all bundled in for free. . . \$329.

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6812	200DL (stand-by power source)	155.
6811	360SX (stand-by power source)	255.
7107	450AT (stand-by power source)	339.
7106	520ES (stand-by power source)	399.
7105	600LS (stand-by power source)	469.
AST Research ... 2 years		
1299	SixPakPlus 384k C/S/P	179.
6795	SixPak 286 512k	209.
4107	RAMPage Plus 286 512k	419.
6980	VGA Plus (w/512K) (800 x 600 res)	229.
Boca Research ... 5 years		
7001	BOCARAM/AT PLUS (0-8 Meg) (LIM 4.0 extended)	125.
7061	BOCARAM/XT OK (0-2 Meg, LIM 4.0)	99.
7135	TophAT (16-bit backfill 512K to 640K)	99.
6998	I/O Board for AT	59.
6999	I/O Board for Microchannel S/S/P	109.
6995	SuperVGA (800 x 600, 16/8 bit)	135.
7026	1024 VGA (16 bit non-interlaced, 512K)	219.
Bravo Communications		
7400	2 Pos. Laser Compatible Switch Box	109.
Brother International ... 1 year		
5787	HL-8e Laser Printer	1699.
5788	HL-8Ps PostScript Laser Printer	2949.
CH Products ... 1 year		
7341	Gamecard III Plus (for Microchannel PS/2s)	49.
7340	Flight Stick	49.
7345	Rollermouse (Trackball) serial	85. bus 99.
Compucable ... 2 years		
1604	2-Position switch box	25.
Cuseta ... 1 year		
1608	Datasaver 400 Watt (power backup)	429.
Curtis ... lifetime		
1694	Emerald SP-2	36.
1707	Ruby SPF-2 (6 outlets)	55.
1708	Ruby-Plus SPF-2 Plus	65.
7358	Command Center	93.
	Glass Filter Plus (anti-glare screen with radiation protection, specify screen size)	each 65.

Nothing obnoxious.



Intel ... 5 years

4275 Connection CoProcessor—Sends and receives faxes from within many popular applications. Communicate without interrupting your work. Includes Central Point's PC Tools Deluxe 6.0 \$529.

Datadesk ... 3 years

6901 Switchboard 175.

Diconix ... 1 year

5655 150 Plus Printer (Parallel) 359.

Epson ... 1 year

We are an authorized Epson Service Center.

1906 FX-850 (80 col., 264 cps, 9 pin) ... call

1904 FX-1050 (136 col., 264 cps, 9 pin) ... call

5183 LQ-510 (80 col., 180 cps, 24 pin) ... call

1930 LQ-850 (80 col., 264 cps, 24 pin) ... call

6765 LQ-1010 (136 col., 180 cps, 24 pin) call

1917 LQ-1050 (136 col., 264 cps, 24 pin) call

5184 LX-810 (80 col., 180 cps, 9 pin) ... call

1052 Printer-to-IBM cable (6 feet) 15.

5th Generation ... 1 year

7157 Logical Connection Plus 512k ... 599.

Hayes ... 2 years

2307 Smartmodem 2400 349.

7391 Ultra 9600 Modem 899.

Hercules ... 2 years

2318 Graphics Card Plus 189.

Hewlett-Packard ... 1 year

6754 LaserJet III (w/toner) 1699.

6582 LaserJet IIP (w/toner) 1069.

Intel ... 5 years

6421 2400B MNP Internal Modem 199.

2352 2400B Internal Modem 2 (for PS/2) 249.

5119 2400 Baud External Modem 179.

6420 2400EX MNP Modem 229.

2346 Inboard 386/PC w/1 Meg (w/free Am) 519.

4266 Above Board Plus 512k 369.

4267 Above Board Plus I/O 512k 399.

5336 Above Board Plus 8 2 Meg 599.

5342 Above Board Plus 8 I/O 2 Meg ... 629.

4272 Above Board 2 Plus 512k 469.

5396 Above Board MC 32 0k 359.

4275 Connection CoProcessor 529.

MATH COPROCESSORS

7385 80287XL (for 80286 CPU's) 229.

4750 80387SX (for 80386SX CPU's) ... 309.

2371 80387 (for 16 MHz 80386 CPU's) ... 349.

2372 80387-20 (for 20 MHz 80386 CPU's) 399.

Key tronic ... 3 years

4518 101 Plus Keyboard 99.

Kraft ... 5 years

5800 3 button Thunder Joystick \$29.

5802 Trackball 69.

Logitech ... limited lifetime

5464 C9 Mouse for PS/2's 69.

5151 HiREZ Mouse (C9) 85.

6029 Trackman (Trackball) serial 85. bus 89.

4297 ScanMan Plus (hand scanner) ... 185.

Micron Technology ... 2 years

6669 Intensify 2 Meg Expansion for HP

LaserJet II (upgradeable to 4 Meg) . 219.

7012 Beyond Memory Board for PS/2

Model 70 (2 Meg) 265.

Microsoft ... lifetime

2897 Mouse with Paintbrush 109.

2898 Mouse with Windows 3.0 149.

MicroSpeed ... 1 year

6007 PC-TRAC Trackball serial 75. bus 85.

Mouse Systems ... lifetime

5997 Trackball (1 yr. wmtly.) serial 75. bus 85.

4306 PC Mouse II w/PC Paint+ 89.

NEC ... 2 years

4799 Multisync 2A (VGA Monitor) 499.

5085 Multisync 3D Monitor 689.



Intel ... 5 years

Above Boards—FREE Quarterdeck QRAM and Manifest with any Above Board or piggyback, now through December 31, 1990! see Intel listing for prices.

Orchid Technologies ... 4 years

7512 ProDesigner VGA II (1024 x 768) . 299.

PC Power & Cooling ... 1 year

REPLACEMENT POWER SUPPLIES

3202 Turbo Cool 150 (25° - 40° cooler) 129.

3200 Silencer 150 (84% noise reduction) 115.

7053 InnerSource 2210 (internal backup) 399.

Pacific Data Products ... 1 year

6779 25 Cartridges in One! (for LJ II, IIP, IID) .275.

7072 25 Cartridges in One! (for LJ III) 349.

Memory upgrade for LaserJet IIP/III

7054 1 Meg. 179. 7055 2 Meg. 249.

1-800/243-8088

MMC
Micro Module Corporation

PC Connection
6 Mill Street
Marlow, NH 03456

760M

SALES 603/446-7721 FAX 603/446-7791



Intel ... 5 years

2346 Inboard 386/PC with Free Samna Am—Gives you 80386 processing power, 1 Mb RAM, and Samna's powerful Windows-based word processor (regularly at \$129). 30 Day Money Back Guarantee. \$519.

6839 Memory upgrade for LaserJet II

1 Meg 179. 2 Meg 249.

7158 Pacific Page (PostScript Cartridge for LaserJet IIP/III) 379.

Practical Peripherals ... 5 years

3101 1200 Baud Internal Modem 65.

3100 1200 Baud External Modem (mini) . 77.

3103 2400 Baud Internal Modem 135.

3102 2400 Baud External Modem 179.

5286 2400 Baud Int. MNP Modem (Lev. 5) 175.

5285 2400 Baud Ext. MNP Modem (Lev. 5) 209.

4542 2400 Baud Internal Modem for PS/2. 229.

7008 P/NET (peripheral sharing) 1189.

Reflection Technology .. 1 year

7127 Private Eye (virtual display) 499.

SAFE Power Systems ... 2 years

4562 Safe 425W (standby power bkup) 329.

6747 Safe 400S (new) 399.

SOTA Technology ... 2 years

5111 SOTA 286i-12 (12 MHz accelerator) 269.

5402 SOTA 386i-16 (16 MHz accelerator) 389.



Intel ... 5 years

MNP Modems—Features data compression, error correction, & a built-in buffer providing compatibility with OS/2.

6421 2400B MNP Internal Modem. \$199.

6420 2400EX MNP Modem 229.

All recyclable.

Targus ... lifetime

7028	Foliopac 1	\$79.
4899	Nylon Laptop carrying case	55.
6037	Premier leather carrying case	199.

TheComplete PC ... 2 years

5140	TheComplete Page Scanner	549.
5828	TheComplete Communicator	559.

Tripp Lite ... 2 years

6199	Isobar 4-6 (4 outlets, 6 ft. cord)	49.
6200	Isobar 6-6 (6 outlets, 6 ft. cord)	59.

Video 7 ... 7 years

5883	1024i VGA (includes 512k)	269.
4931	VRAM VGA 512k	379.

DRIVES

IOMEGA ... 1 year

5116	Bernoulli II Single 44 Meg Internal	995.
5117	Bernoulli II Dual 44 Meg External	1969.
5113	44 Meg Cartridge Tripack (5 1/4")	249.
2499	PC2 Controller	169.
7551	Bernoulli II Transportable 44 Meg	1299.

Mountain Computer ... 1 year

2917	40-60 Meg Internal Tape Drive	379.
5502	83-152M Ext. Tape Drive	799.
5500	83-152M Int. Tape Drive	629.
5190	DC2000 Pre-formatted Cartridges ea.	35.



FormWorx ... NCP
7311  **Form Publisher for Windows 1.2**—Desktop publishing designed especially for creating professional-quality forms. Use unique object-oriented design techniques & import graphics. Over 600 forms included! .. \$145.

Pacific Rim ... 1 year

5010	1.2 Meg External (for PS/2's)	215.
6602	1.44 External (for PC/XT/AT)	239.

Plus Development ... 2 years

6425	Hardcard II 40 Meg (19 ms)	599.
6424	Hardcard II 80 Meg (19 ms)	699.

Seagate ... 1 year

2285	20 Meg Int. Hard Drive ST225 (w/controller and cables, 65 ms)	275.
2286	30 Meg Int. Hard Drive ST238 (w/controller and cables, 65 ms)	289.

4554	40 Meg Int. HD ST251-1 (28 ms)	359.
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TEAC ... 1 year

4951	720k Drive (specify XT or AT, 3 1/2")	75.
4670	1.44 Meg Drive for PC/XT (3 1/2")	89.

4326	1.44 Meg Drive for AT (includes Bastech software utilities, 3 1/2" copy prot.)	109.
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MISCELLANEOUS

Checkfree

6360	CheckFree (electronic checking srv.)	\$25.
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CompuServe

7546	DOS Membership Kit	23.
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DISKS

Maxell ... lifetime

2789	5 1/4" MD2-D 360k Disks (Qty. 10)	12.
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Reflection Technology ... 1 year

7127 **Private Eye**—A large screen in a small box. A tiny virtual display which offers a full-size, 12" IBM CGA auxiliary screen to PCs & laptops. View privately in planes or meetings. Brighter than LCDs. \$499.



ButtonWare ... NCP
6419  **PC-File 5.0**—The most friendly, comprehensive database available. It includes letter-writing with mail merge, business graphing and a powerful report writer. It also works directly on dBase files \$75.

2790	5 1/4" MD2-HD 1.2Mb Disks (Qty. 10)	19.
2792	3 1/2" DS/DD 720k Diskettes (Qty. 10)	14.

2793	3 1/2" DS/HD 1.44Mb Diskettes (Qty. 10)	27.
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Sony ... lifetime

3291	5 1/4" DS/DD 360k Disks (Qty. 10)	10.
3292	5 1/4" DS/HD 1.2Mb Disks (Qty. 10)	19.

3297	3 1/2" DS/DD 720k Diskettes (Qty. 10)	13.
3298	3 1/2" DS/HD 1.44Mb Diskettes (Qty. 10)	22.

6659	QD 2000 Tape Cartridge	19.
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MEMORY

6556	256k DRAMs (100 nanosecond)	call
3248	256k DRAMs (120 nanosecond)	call
4366	1 Meg x 9 SIMMs (100 nanosecond)	call
5510	1 Meg x 9 SIMMs (80 nanosecond)	call
5746	1 Meg Chips (80 nanosecond)	call

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Iomega ... 1 year
7551 **Bernoulli II Transportable**—The compact version of the Bernoulli Universal family removable media drive, offering users the freedom to easily move his/her Bernoulli drive from one AC outlet to another \$1299.

SHIPPING

Note: Accounts on net terms pay actual shipping.

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- For heavy hardware items such as printers, monitors, Bernoulli Boxes, etc. pay actual charges. Call for UPS 2nd-Day & Next-Day-Air.
- For all other items, add \$3 per order to cover UPS Shipping. For such items, we automatically use UPS 2nd-Day-Air at no extra charge if you are more than 2 days from us by UPS ground.

Hawaii:

- For monitors, printers, Bernoulli Boxes, computers, hard drives, and power backups, actual UPS Blue charge will be added. For all other items, add \$3 per order.

Alaska and outside Continental US:

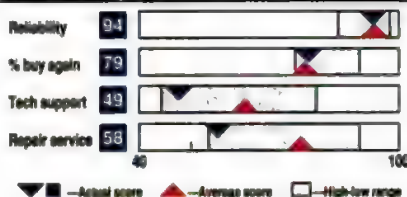
- Call 603/446-7721 for information.

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Everex Systems Inc.

EGA Adapters



the tech support he got. "When I called their service department, they didn't offer much help. The documentation had mistakes in the setup on a board that had been out for a while. I can understand it in the manual, but for the service technician not to know about it or understand it once it was pointed out? No excuse," says Young.

Everex says its challenge is to reduce hold time on the tech support lines and to improve turnaround in repair. One step toward this goal was an increase in the tech support staff by 25 percent. There are now 70 people in tech support, 25 in customer service, and 60 in repair. Since June, technicians cover the phones an additional 2 hours a day, from 6 A.M. to

SERVICE AND RELIABILITY GRAPHICS ADAPTERS

7 P.M. Pacific time. "We've also created a compatibility lab, bought a new phone system, and developed a problem escalation system that adds levels of tech support," says Alan Thygesen, assistant manager of customer support for Everex. Everex has also developed a training program for Authorized Service Centers intended to expand local service options for its customers.

A PROVEN NAME

Only 79 percent of the respondents say they would buy another graphics board from Everex—a decent but not spectacular percentage. Those who would may feel that the primary attraction is the security of a major brand name. One of them is Jose Ortiz, a budget analyst for the state of California, who traded his Jaton VGA for an Everex model. "I learned from experience that dealers do not know the quality of the merchandise they sell. For monitors, graphics cards, and PCs, I'll stick to proven names."

CIRCLE 406 ON READER SERVICE CARD

Genoa Systems Corp.

by Wendy Murch

COMPANY SCORES



75 E. Trimble Rd.
San Jose, CA 95131
(408) 432-9090
(800) 423-6211 (technical support)

Actual score (black square), Average score (red triangle), High-low range (white box with black border)

Headquartered in Taiwan, Genoa Systems Corp. is an international vendor of graphics adapters, 3270 PC-to-mainframe adapters, combination 3270/VGA boards, and tape backup controller cards. Its graphics adapters, all based on proprietary chip sets, are sold via distributors and large retail chains across the United States. They range from basic EGA and VGA cards to the high-end 6000 series, which offers 1,024 by 768 resolution and 70-Hz refresh rates for reduced flicker.

BUGGY BOARDS

Genoa's graphics adapters show a slightly lower-than-average reliability, incurring a relatively high problem incidence of 18 percent. The trouble seems to center mostly in Genoa's VGA adapters. Its more common EGA boards score about average in reliability and problem incidence.

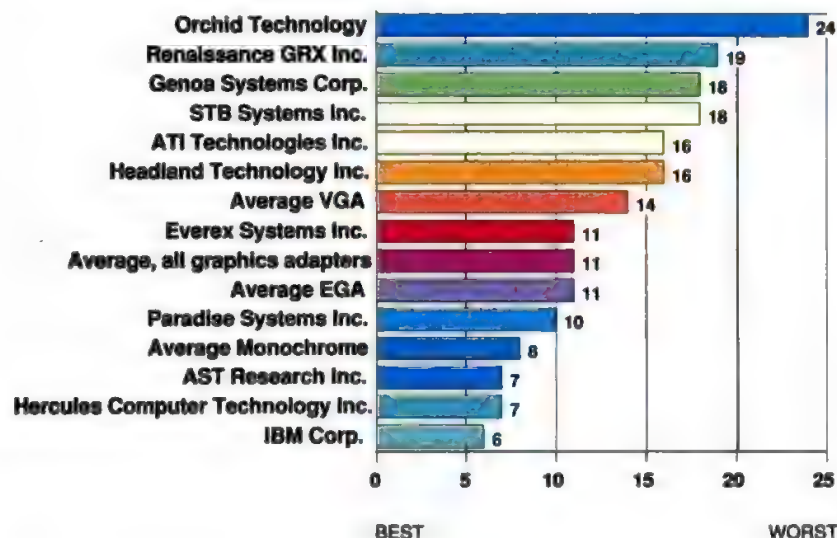
Darwin Chang, Genoa's product manager for graphics boards, admits that Genoa's VGA adapters have suffered from BIOS compatibility problems. "We have had problems with the 5000 series cards, and we're trying to phase them out." The trouble, he says, stems from the fact that this series was designed to be 100 percent compatible with the 8-MHz IBM AT. Genoa hadn't allowed for a wide enough margin of clock error, causing BIOS problems with clones that run at bus speeds slightly higher or lower than 8 MHz, or when a user moves the card from machine to machine. San Franciscan Bob Toltzis had this problem: his Genoa 5400 board worked fine in his IBM AT but failed when he tried it in a Mylex 386 clone.

GRAPHICS ADAPTERS: INCIDENCE OF PROBLEMS

Problem incidence gives a more varied picture than reliability ratings. Orchid Technology's ratings suffer severely from problem-prone products, whereas respondents reported few problems with IBM, Hercules, and AST Research products.

The average problem incidence for a company is the percentage of survey respondents who use one of the company's products, and who reported a problem during the time they'd been using the product.

OVERALL PROBLEM INCIDENCE (%)



ON THE POSITIVE SIDE

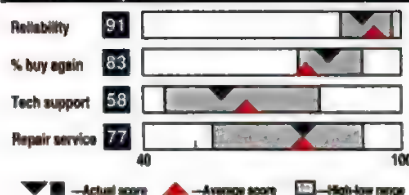
This aside, Genoa's products have some loyal followers. Timothy Caywood, a

Genoa Systems Corp.

VGA Adapters



EGA Adapters



computer consultant and owner of a 5100 Super VGA card, says "It's just been a dream all the way around. It's less trouble than the Paradise or Video Seven cards my friends have. When I shadow the BIOS with this thing, it flies." And Christian Wehlus of Burbank, Illinois, says "It's so transparent I don't even know I have it. You can't give a much better compliment to a graphics board than that. I use it extensively with AutoCAD. I'm up to Version 10 now, with never a problem." Easily accessible switches, the 132 by 60 wide-screen mode for spreadsheet use, and a profusion of drivers are also cited numerous times by satisfied users.

Genoa scores about average in tech support (with EGA being slightly below average) and above average in repair. From the respondents we've spoken with, it seems that those who have used these services within the past year are generally more satisfied with the results than those who used it in the period before that. Robert Morris, of Toledo, Ohio, remarks, "About two years ago I had a BIOS problem with my board. I left message after message for tech support, but no one ever called me back. When I finally did get through, they just weren't much help at all."

ON THE UPSWING

All this seems to have changed. According to technical support manager Herman Wadler, there was a three-week backlog when he took over the position last August. Since then, he's created a network to help tech support personnel quickly identify problems and keep them up to date on solutions. Incoming calls take priority as a means of keeping backlog to a minimum, but the staff aim to return calls

within 24 hours. Michael Morrow, a systems engineer at TRW, found this to be true: "I called about two weeks ago and left a message on voice mail. A guy called me back the next day."

For customers with problems tech support can't solve, Genoa either will swap the board (if it's currently shipping) for the same model with modified chips or, in the case of an outdated model, will allow you to upgrade it for a nominal fee. Dr. Steve Green, a biology professor at the University of Miami, was one of our respondents who took advantage of this policy: "My card was about three to four years old and out of warranty when it malfunctioned. It was replaced for \$75. I think it's a real good value."

Genoa has had its problems in the past, but the company may be worth a second look, to judge from the response of recent customers.

CIRCLE 409 ON READER SERVICE CARD

Headland Technology Inc. (Video Seven)

by Rock Miller

COMPANY SCORES



46221 Landing Pkwy.
Fremont, CA 94538
(415) 623-7857
(800) 238-0101 (sales)
(800) 248-1850 (technical support)

▼ Actual score ▲ Average score □ High-low range

Headland Technology, through its Video Seven subsidiary, is a major vendor of EGA and VGA boards for personal computers. Its VEGA Deluxe was one of the most popular EGA cards, and it has more recently introduced a number of popular VGA cards. But you need to be selective in the models you choose, as the reliability of the company's EGA and later VGA cards are offset by problems in some of its earlier VGA models.

The VEGA Deluxe EGA card has a reasonably solid record. Its overall problem incidence is 14 percent, somewhat higher than the 11 percent for all EGA

cards. But 82 percent of the respondents rate the VEGA Deluxe very reliable, versus 77 percent for all EGA cards.

PROBLEM BOARDS

When it comes to VGA boards, however, the earlier models show a concentration of headaches. The FastWrite VGA, a 16-bit Super VGA card whose speed impressed us last year in our review of 800 by 600 boards ("16-bit VGA Boards Stretch the Standard," *PC Magazine*, July 1989), looks especially bad. Fully 25 percent of the respondents report problems—substantially worse than the average of 14 percent for VGA respondents, and one of the worst in our survey. Only 70 percent of the respondents rate their FastWrite boards very reliable, versus 75 percent for VGA cards as a whole, and 9 percent rate it unreliable.

Part of the FastWrite's problem may be due to faulty design. "I think it's an overheating problem. The board runs very hot in the area of the RAM DAC," says Joseph Covello, the field service manager for Computer Products Unlimited of Clifton, New Jersey. "I'd use it for 20 to 30 minutes, then would start losing it. You'd see the pixels blacking out here and there. Eventually, it would go out." Though he has had the board replaced twice, he says, "the board still does show a slight jitter in the display. It's always in the back of my mind that it might fail again."

The company's 8-bit VEGA VGA also shows a rather poor record of reliability. Only 71 percent of the respondents rate their VEGA VGA boards very reliable (versus 75 percent of all VGA users), and 11 percent rate theirs below reliable (compared with 6 percent overall). 23 percent of VEGA VGA users report problems, quite high in comparison with the 14 percent shown for VGA overall.

Ted Johnston, Video Seven's technical support manager, points out that both cards have been substantially improved since their release. The FastWrite VGA, he says, has been taken off the market in favor of the next-generation 1024i. "We fixed a lot of the problems in the process. The 1024i is one of the most reliable cards we have." Video Seven has also worked to improve the VEGA VGA, he says. "When the card was first released in 1987, it was not by any means IBM-compatible. Since the initial release, we have gone through 47 BIOS revisions, and there has been a substantial improvement." Both

cards are still under warranty and are fully supported, he adds.

A RECORD OF IMPROVEMENT

The record of Video Seven's more recent models seems to bear out Johnston's contentions. The VGA 1024i board is given good ratings by respondents who own them, with 79 percent rating it very reliable and only 12 percent reporting problems. In fact, several 1024i respondents have taken the trouble to comment on the survey how much they like it. The

SERVICE AND RELIABILITY GRAPHICS ADAPTERS

VRAM VGA respondents aren't quite as glowing, but they give the board fairly good ratings nevertheless. Its reliability rating of 92 and its problem incidence of 16 percent are about average, and 78 percent of the respondents rate it very reliable, versus 75 percent for VGA users overall.

In any case, respondents indicate high confidence in Video Seven as a company. Even with the least reliable board, the

FastWrite VGA, 84 percent of the respondents would buy again from Video Seven, about average. Of the 1024i respondents, 91 percent say they would buy again, while 89 percent of the VRAM VGA respondents say the same thing. Video Seven must be doing something right.

One reason might be high-quality drivers, cited by some CAD users. "I've got experience with a lot of VGA boards, and I wouldn't consider anyone else's board," Covello says. "I haven't come across anyone who has software drivers as good



Report from the Video Standards Front: Comparing the Categories

by Rock Miller

The reviews can tell you how companies rate, but what about video standards? In our survey, the products were divided into categories corresponding to the major video standards: monochrome (which includes Hercules-standard monochrome graphics adapters as well as IBM-standard monochrome text), CGA, EGA, VGA (which also includes Super VGA adapters capable of 800 by 600 and/or 1,024 by 768 resolutions), and 8514/A (both IBM and clones).

An inspection shows some clear trends, at least among the relatively sophisticated population that has answered our survey. Almost all have opened up a system before, and those who say they've done major repairs such as memory upgrades and disk drive installation are in the range of 70 to 80 percent. A tour through the survey responses reveals a goodly number of people involved in CAD or graphics work professionally, whose comments show in-depth acquaintance with the merits of various graphics adapters and with the problems of high-resolution drivers. A full 94 percent are responsible for choosing or recommending PC hardware and software, either formally or informally.

IT'S ALL IN THE NUMBERS

The survey confirms that VGA is the dominant standard in the installed base as well as in the marketplace. With 5,400 responses, VGA users outnumber all the other standards combined and outstrip EGA users (with 1,492 responses) by more than 3 to 1. The gap

will only get wider as time goes on: only 22 percent of the EGA cards were purchased within the last year, compared with 64 percent of the VGA cards. Though most respondents say their present equipment meets their needs today, fully 40 percent of the EGA users say their boards will no longer do so within the next year, versus only 21 percent of the VGA users. Similarly, 63 percent of the EGA users contemplate upgrading within two years, versus 49 percent of the VGA users.

The story for monochrome adapters is similar. Once, these offered a viable low-cost alternative for text-mode programs and simple graphics. But aggressive pricing of VGA adapters and monochrome VGA monitors, plus the increasing use of color graphics, have reduced their appeal. The survey reflects this basic fact: though 871 of our respondents have monochrome graphics, only 23 percent of them bought their cards within the last year, and 65 percent of those who aren't already in need of an upgrade estimate that they'll need one within the next two years.

RELIABILITY ISN'T EVERYTHING

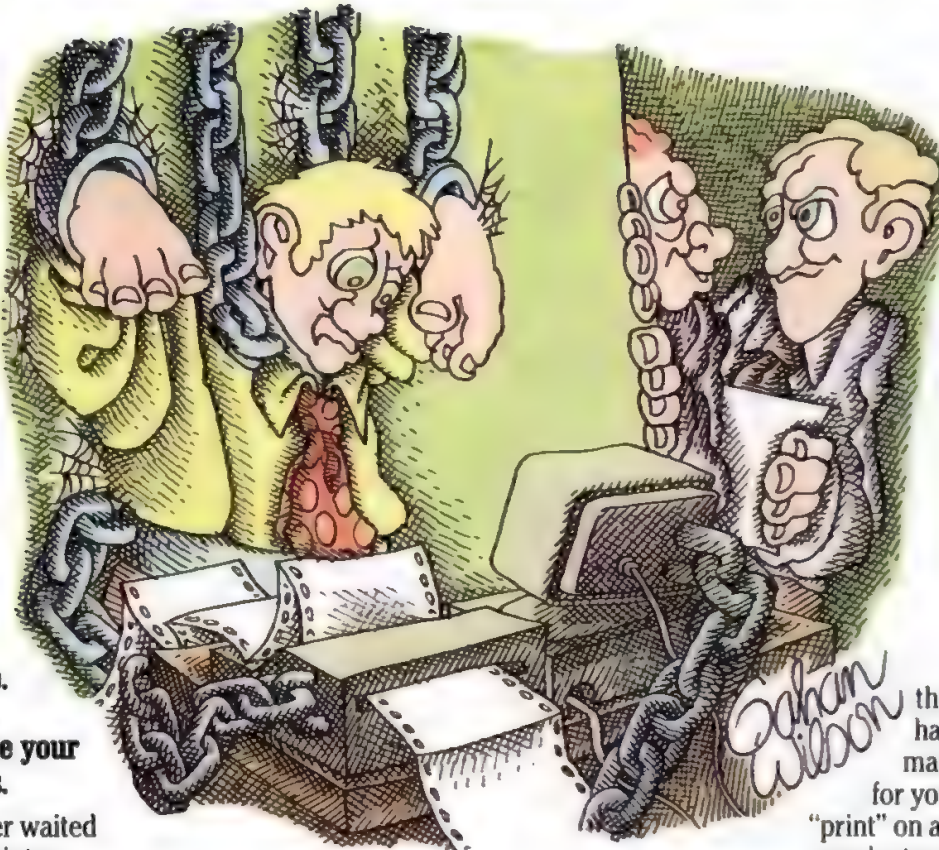
As for reliability, the older standards have a slightly better record. VGA and EGA users report the most problems: 14 percent of the VGA users and 11 percent of the EGA users have experienced trouble, versus 7 percent of the monochrome users and only 6 percent of the CGA users. The mean number of occasions on which problem cards have been unusable or impaired is 5 times

for VGA and 6 for EGA, but only 3 for monochrome and 2 for CGA. 75 percent of the VGA users rate their graphics boards in the most reliable category, versus 77 percent of the EGA and monochrome users and 80 percent of the CGA users.

This is hardly surprising: EGA and VGA cards are more complex and offer more ways to go wrong, especially in extended resolutions not covered by the IBM standard, where trouble-free operation is a slave to the quality of the drivers provided by the manufacturer. Nevertheless, the additional power appears to be worth the risk. In terms of expectations, 88 percent of the VGA users say their graphics adapters meet their needs today, compared with 82 percent of the EGA users. Meanwhile, only 75 percent of the monochrome users and 65 percent of the CGA users think so. It may be indicative that 81 percent of the VGA users selected what they use, as did 75 percent of the EGA users, versus only 67 percent of the monochrome users and 68 percent of the CGA users.

At the same time, the figures show the persistence of an irreducible hard core who like what they've got and will use it for the life of the product. For instance, though 42 percent of the CGA users expect to upgrade in a year and 65 percent expect to do so within two years, 11 percent expect their setup will still meet their needs after five years. Similarly, 39 percent of the monochrome users expect to upgrade within a year, and 67 percent within two years, but 9 percent say it will still suit their needs after five years. ■

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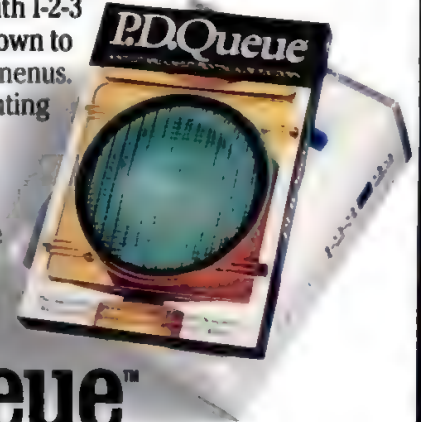
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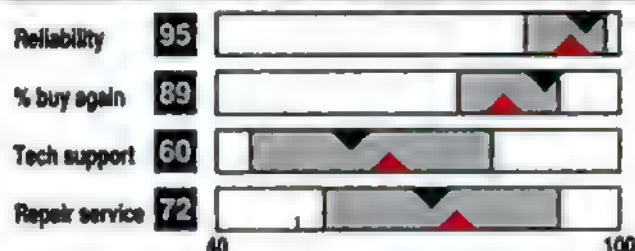
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SERVICE AND RELIABILITY GRAPHICS ADAPTERS

Headland Technology Inc.

Video Seven VRAM VGA



Video Seven 1024i



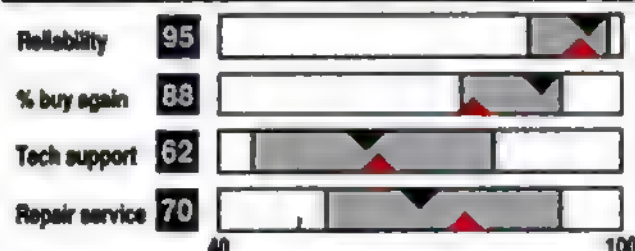
Video Seven Fastwrite VGA



Video Seven VEGA VGA



Video Seven VEGA Deluxe



▼ ■ —Actual score ▲ —Average score □ —High-low range

as they provide. They have excellent *AutoCAD* drivers, for instance."

KNOWLEDGEABLE SUPPORT

An equally good reason for loyalty is that Video Seven delivers generally good technical support. Jeff Hitchcock, an engineer with Applied Signal Technology in Herndon, Virginia, says, "Their customer support is just short of excellent. When I needed OS/2 1.2 drivers, I had them in hand, with a new BIOS, no charge, in a couple of days." Video Seven respondents rate their overall satisfaction with technical support at 70, above the average of 66. 48 percent of these are very satisfied, versus 45 percent for all manufacturers on the average. Those dissatisfied or very dissatisfied come to 18 percent, lower than the 25 percent for manufacturers overall. 48 percent of those respondents

who have used the tech-support hot line are very satisfied with it, which is better than average.

Indeed, the hot line may be too popular: it's sometimes difficult to get through, and long waits are not uncommon, respondents say. "Video Seven's tech support is a permanent hold! It took me over a week to get help," says Craig Cecil, an engineer with Amdahl in Tennessee. "You can get long waits," Johnston admits. "None of our support reps have a quota or a time limit. We don't cut calls short." He also notes that users can leave messages by phone or fax, to be called back later at a particular time: "We try to return messages within 24 hours."

Once people do get through, they seem to find technically competent representatives to help them. "The hot line is constantly busy, and it took several faxes to get attention. But the customer support people were knowledgeable and courteous," says Joe Nicastro, a group leader for RIC Systems, a mechanical design firm in Norwalk, Connecticut. "They figured out that it was a memory chip and made the decision to ship it back quickly." Covello is similarly impressed: "I called tech support about *Windows* in graphics mode with 386MAX, and they told me right away what memory ranges to lock out. They did seem to know their board."

RETURN RECEIPT REQUESTED

Video Seven rates fairly well on repair service, with a satisfaction rating of 75, versus the average score of 68. 58 percent of those who have had problems rate themselves very satisfied with Video Seven's repair service, versus 50 percent overall for manufacturer service. Video Seven offers a seven-year warranty, the longest warranty of any company in this review.

Complaints, as usual, center on turnaround time. "They said it would take three weeks, and I said that's a long time," says Marc Beckwith, a senior documentation engineer with Garrett Fluid Systems Division in Tempe, Arizona. "Their alternatives were for me to convince a local vendor to make a swap or to pay the freight for Federal Express, which was more than I wanted to spend. I wanted to give them my credit card number so that they could ship the replacement card before they got my card. They said it wasn't their policy." Johnston says that users do have this option, however. "We ship in

advance with a credit card if inventory allows it, though it's not the norm."

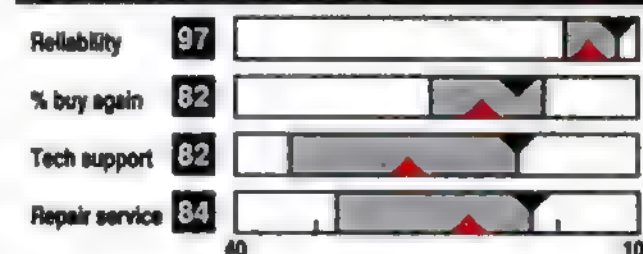
Video Seven has had a checkered reliability record in the past, and some of its products have given more than their share of problems. But competent technical support and quality drivers have given the company an enduring following. Given that its currently selling products appear quite reliable, the company looks like a good bet.

CIRCLE 410 ON READER SERVICE CARD

Hercules Computer Technology Inc.

by Wendy Murch

COMPANY SCORES



921 Parker St.
Berkeley, CA 94710
(415) 540-5000
(415) 540-0749 (technical support)
(800) 532-0600 (sales)

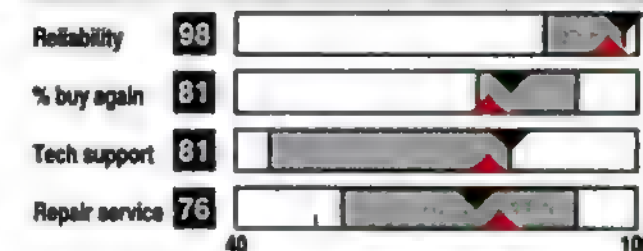
▼ ■ —Actual score ▲ —Average score □ —High-low range

Hercules Computer Technology offers a full line of graphics adapters, from the standard-setting monochrome graphics card and its successor, the Graphics Card Plus, to a less-popular range of color graphics adapters. No matter which model you have, to judge from the survey, Hercules makes some of the most reliable graphics boards you can own, and its technical support and repair service are equally highly regarded by our respondents.

Hercules's company reliability score of 96 places it at the top of the pack. 85 percent of Hercules respondents rate their boards very reliable, and not a single one rates his board unreliable. To be fair, the bulk of the Hercules installed base is in

Hercules

Monochrome Graphics Adapter



▼ ■ —Actual score ▲ —Average score □ —High-low range

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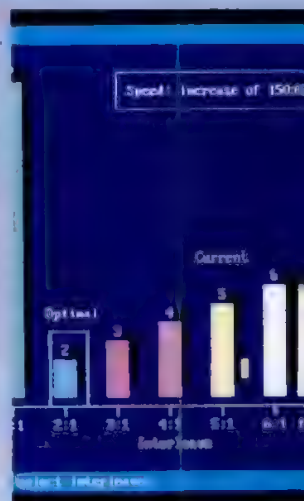
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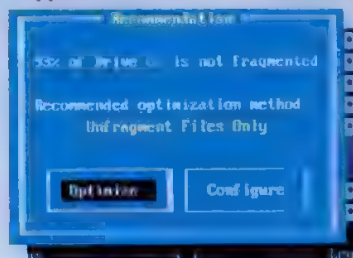
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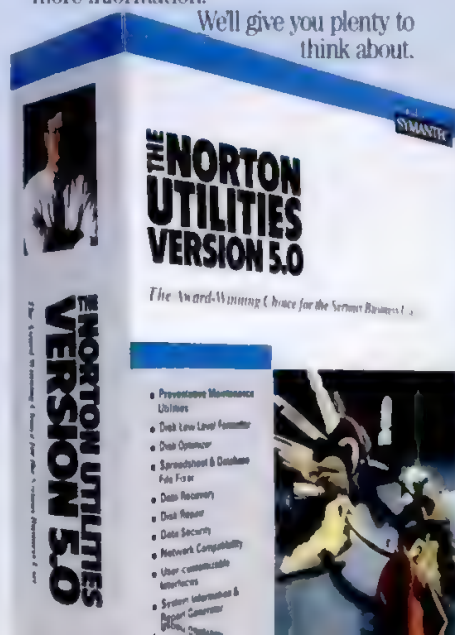
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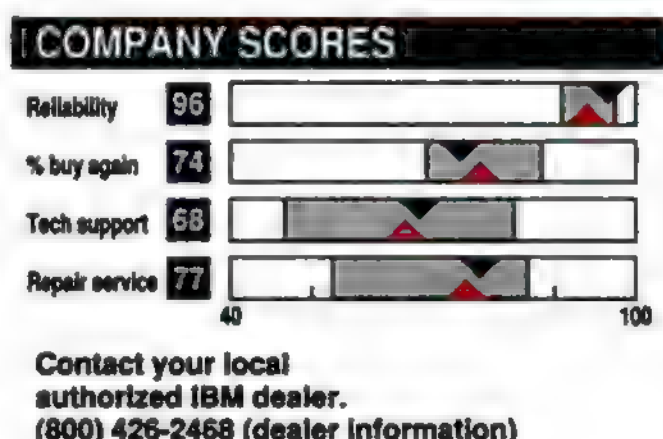
monochrome cards (of the 403 respondents with Hercules cards, 306 of them are monochrome), which are typically more reliable than the EGA and VGA cards that dominate other manufacturers' product lines. Yet Hercules scores quite well in terms of reliability even in relation to other monochrome cards. Only 77 percent of the monochrome card respondents rate their boards as very reliable—quite a difference when you consider that over a third of the monochrome card respondents have Hercules cards. These figures should comfort those who paid the significantly higher price it takes to acquire the genuine article.

IT JUST WORKS

The best testament to Hercules products is that people have little to say about them. As Kurt Dohse of Dewitt, Iowa, puts it, "Well, it works. What more do you want?" Given that only 7 percent of the Hercules respondents report problems, it is difficult to find people who have ever had an occasion to use the company's technical support or repair services. Those who have give Hercules high ratings in both technical support and repair. James Martin, a dentist from Dallas, Texas, is one of these few, and he observes, "Both

IBM Corp.

by Wendy Murch



▼ ■ —Actual score ▲ —Average score □ —High-low range

IBM wrote the book on PC video standards, and despite the proliferation of lower-cost, higher-performance alternatives, Big Blue retains its hold on the installed base. Over 1,400 of our respondents own IBM video adapters, more than those of any other vendor except Paradise Systems and ATI Technologies. This is hardly surprising when you consider that most of IBM's computers come with an IBM video adapter on the motherboard. But is True Blue worth what it costs?

Of the respondents who indicate they wouldn't buy again from IBM, most of those we have spoken with cite price as the reason.

times I called tech support, they were quick, friendly, and helpful."

The number of survey respondents who indicate they would buy from Hercules again in the future, though above average, is not at the top. Why not? Probably because most people see Hercules as "the monochrome people." As Eric Lee of Mt. Prospect, Illinois, puts it, "Maybe because I know nothing about their other cards, I wouldn't have any reason to consider buying them."

It's hard to tell from our survey how well Hercules's color products stack up against the company's monochrome efforts. But based on past performance, Hercules gives every appearance of being a company with reliable products and first-rate support.

CIRCLE 411 ON READER SERVICE CARD

RELIABLE BUT EXPENSIVE

IBM's graphics adapters certainly uphold the company's reputation for high-quality products. Just 6 percent of the IBM respondents had problems with their graphics boards, the lowest incidence of any manufacturer. IBM's average reliability rating of 96 is equally impressive. The overall problem incidence of its VGA boards is very low at 5 percent, though the absence of trouble-prone extended VGA modes on IBM's PS/2 display adapters probably has a lot to do with this.

Comments from respondents back up these numbers. Jerrel Baxter, Director of Campus Computing at Birmingham-Southern College in Birmingham, Alabama, for instance, says, "Our machines get about three times the usage of most machines. In terms of failure rates, IBM

machines are much better than anything else. We've been really, really pleased with IBM in general."

With scores like this, one would expect to find a very high percentage of customers willing to buy graphics boards from IBM again in the future. But that isn't the case. In fact, only 74 percent of the respondents say they would buy from IBM again, the lowest percentage of any manufacturer.

Of the respondents who indicate they wouldn't buy again from IBM, most of those we have spoken with cite price as the reason. William Reddy, a PC systems analyst in Syracuse, New York, says, "IBM boards are very reliable, but I wouldn't buy them again because of price." John Seiffer of Dallas, Texas, agrees: "I wouldn't buy from IBM again because the prices are too high. I don't see that you're getting anything for the extra money that you couldn't find in a lower-priced clone."

SERVICE TO SOME

IBM offers service either through authorized dealers or through expensive but comprehensive on-site service contracts executed by its own field service. From our survey, it appears that users with on-site service contracts are on the whole much happier with IBM's service than those who rely on dealer service. Comments from respondents bear this out. Dr. Robert G. Stevenson, a scientist at Campbell Soup Co. in Camden, New Jersey, reports, "Whenever I've had a problem with my IBM, I've called our service rep, she comes in, fixes things, and they work. I've always had help within 24 hours, sometimes sooner." On the other hand, Eric Fisher of Tacoma, Washington, found himself with a problem that his dealer couldn't or wouldn't fix. He says, "I'm not too happy about spending the extra money and not getting the extra service I'm supposed to get. I'm not likely to buy another IBM."

BLUE CUSTOMERS

IBM's chief handicap may be a problem with living up to user's expectations. Jeff Duncan, a senior engineer at Dunn Geoscience Corp. in Parsippany, New Jersey, says of his PS/2 Video Adapter, "I was disappointed that there's no ability to upgrade—no add-ons are available." And Charles Foxwell, president of Foxwell Financial, complained, "I'm disappointed at the lack of support for the 8514/A

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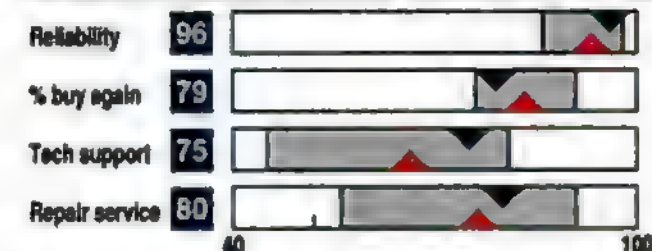
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CIRCLE 110 ON READER SERVICE CARD

SERVICE AND RELIABILITY GRAPHICS ADAPTERS

IBM Corp.

IPS/2 Display Adapter



IBM EGA Adapter



▼ Actual score ▲ Average score □ High-low range

graphics adapter. Even Microsoft does not test most of its programs for 8514/A compatibility. For something that IBM has been pushing as the best for two and a half years, their effort to get it accepted as a standard has not lived up to the expectations I had when I took their word that the extra money would be worth it."

The story with IBM is simple. If reliability and service are of supreme importance to you and you're willing and able to pay a high price for them, you'll probably be very satisfied with your IBM video adapters. But if price and performance play a factor, you'd be better off looking elsewhere.

CIRCLE 412 ON READER SERVICE CARD

Orchid Technology

by Stephanie Izarek

COMPANY SCORES



45365 Northport Loop West
Fremont, CA 94538
(415) 683-0300 (sales)
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▼ Actual score ▲ Average score □ High-low range

It is sometimes better to know a lot about a little than it is to know a little about a lot. Orchid Technology has five primary product lines: graphics, memory/multifunction, accelerators, products for the Macintosh, and 386- and 486-based motherboards. The bulk of its sales, however, are

in graphics boards, handled mostly through OEM and VAR channels but increasingly through direct sales to major corporations.

Yet, to judge from the results of our survey, Orchid's graphics boards (represented mostly by the ProDesigner line of VGA boards) are mediocre at best in terms of their reliability. The Orchid respondents to our survey give an average reliability rating of 89 to their boards—acceptable enough when compared with other companies. But the problem incidence of Genoa's entire line of boards is rated at 24 percent, considerably higher than the overall problem incidence of 11 percent. And Orchid's VGA boards have a problem incidence of 27 percent, compared with 14 percent of all VGA boards.

TOO MANY PROBLEMS

Our conversations with survey respondents indicate that most of the problems with Orchid boards are related to compatibility and general performance deficiencies. According to a company representative, Myrna Nickelson, Orchid is phasing out its most problem-prone model, the original ProDesigner, in favor of the high-resolution ProDesigner II.

Nevertheless, Orchid's customers are generally willing to buy from the company again: 77 percent of the Orchid respondents report that they would purchase another board from Orchid—about average for all boards reported, though slightly below the overall average for VGA boards. Why should this be?

The answer, it seems, is that although problems occur, the performance of the boards is quite satisfactory when they do work. This point is articulated best by Howard Springer, owner of Island Engineering in Washington, who says, "The problem with my Orchid VGA board was apparently due to incompatibility with my CAD program. After I began dealing with Orchid's helpful tech staff, they asked me to return the board for repair; I did so, and the board has operated fine ever since. I would definitely purchase another board from Orchid."

TECH SUPPORT WOES

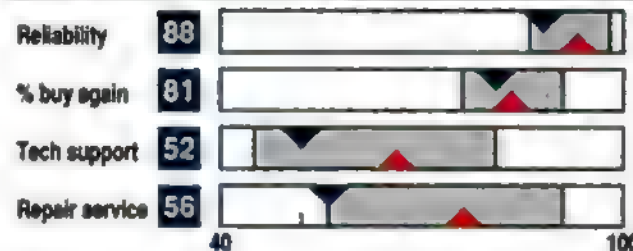
Not all Orchid users have had such a painless experience with Orchid's technical support and repair service, however. In fact, the Orchid users who answered our survey rate the technical support some-

Orchid Technology

VGA Adapters



ProDesigner Plus



▼ Actual score ▲ Average score □ High-low range

what below average. The same is true of repair service for Orchid's VGA boards. Jeff Dietrich, the president of Wrist Wrist in Wichita, Kansas, says, "The problem I had with Orchid's ProDesigner card was the most frustrating experience I have ever had. The tech staff is composed of the most lame collection of bozos I've ever had the misfortune of dealing with. I eventually got my money back and bought a card from a different vendor—now I'm happy."

A possible explanation for unsatisfactory technical support may be that the small staff of seven must answer questions for Orchid's entire product line—not just graphics. According to Nickelson, Orchid is aware of its technical support problems, and it plans to implement revisions such as technical training for the entire staff so that everyone will be competent enough to handle graphics questions.

In addition, the new 24-hour automated phone service dedicated to common questions, which will hopefully free up the phone lines for more serious problems, should be up and running by July 1990. Orchid already provides free software updates and BIOS upgrades and maintains a message area for technical questions. In speaking with us, Nickelson has not addressed the problem of unsatisfactory repair service.

Orchid seems to have had more than its share of reliability and service problems. Though it is making an effort to improve its product line and support services, it perhaps needs to devote more staff and attention to its graphics boards. You may still want to consider Orchid—but do so with care.

CIRCLE 413 ON READER SERVICE CARD

Paradise Systems

by Rock Miller

SERVICE AND RELIABILITY GRAPHICS ADAPTERS

COMPANY SCORES



800 E. Middlefield Rd.
Mountain View, CA 94043
(415) 960-3360
(800) 356-5787 (technical support)

▼ Actual score ▲ Average score □ High-low range

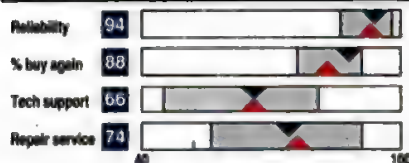
Paradise Systems, a division of Western Digital since its purchase in 1986, is one of the largest and most successful vendors of both EGA and VGA boards in the industry. The company's AutoSwitch EGA board was very popular in its day, and its VGA Plus and VGA Professional boards have also been top sellers. Though Paradise boards aren't always the fastest or the fanciest, they are in widespread use, particularly through OEM contracts with such computer vendors as Hewlett-Packard, Zeos, Northgate, CompuAdd, Tandy, Unisys, Dell, and AT&T. Paradise also offers one of the most popular VGA chip sets, and many branded graphics adapters (including those from AST Research) are based on Paradise technology.

Paradise Systems Inc.

VGA Professional



VGA Plus



Autoswitch EGA



▼ Actual score ▲ Average score □ High-low range

Paradise boards are better than average when it comes to reliability. The company's overall reliability ratings of 94 for VGA cards and 95 for EGA cards are on the high side of the average, and these do slightly better than the norm on overall problem incidence as well. 10 percent of the Paradise VGA respondents report problems, versus 14 percent of all VGA respondents, and the corresponding figures for EGA are 9 percent and 11 percent, respectively. 80 percent of the AutoSwitch EGA respondents rate their boards very reliable, versus 77 percent for EGA as a whole; 80 percent of the VGA Plus respondents and 81 percent of the VGA Professional respondents say the same thing about their boards, versus 75 percent for VGA boards as a whole.

SOLID QUALITY

It's easy to find praise for the basic quality of Paradise cards. Carlen Hoppe, a software engineer for ESSCOR in Solana Beach, California, says, "The cards are good. I use both Paradise and AST, which uses the Paradise chip set. Maybe one of them failed over the years, and the dealer swapped it out right away." And Carl Kuppe, a senior analyst for the Baltimore County Office of Family Resources, notes, "I run a bunch of graphical programs, and I've had no problem as far as incompatibility or switching modes goes." Such praise probably accounts for the company's good reputation among our respondents: 87 percent of the EGA users and 88 percent of the VGA users would buy again from Paradise (versus 78 percent of the the EGA respondents and 83 percent of the VGA respondents overall).

If there's a problem with Paradise boards, it lies in their drivers. CAD users and others who depend on high-resolution drivers aren't always happy with them. Dave Ferguson, a construction project manager for United Care of Wayne, Michigan, says of the Paradise 800 by 600 by 256-color AutoCAD driver, "It never configures right." Now he uses an Orchid ProDesigner Plus, which, he says, has good drivers. Dave Foley, director of software engineering, points out that a display list driver for AutoCAD will be released in early August and should substantially boost the performance of Paradise boards in that application.

Still, drivers aren't always as timely as they should be. As Marvin Bendik, a CPA

for the accounting firm of Schwartz, Kales in Los Angeles, says of his VGA 1024 card, which he bought last November, "There was a notice in the box that said that the drivers weren't ready. It took four to six weeks to finally get them. The drivers weren't that critical, but I was upset that they put out a product without all the software that they had advertised."

NO WAITING

Paradise Systems has generous technical support policies, including a three-year warranty on all of its graphics adapters, free software and BIOS updates, and a 30-day dealer replacement policy. To assist end users with repair problems, it offers mirror shipment and overnight shipment options. Our survey shows average satisfaction ratings across the board.

To its credit, Paradise Systems does not appear to suffer from the interminable hold queues that afflict other vendors. Most of the survey respondents we have spoken to said that getting through to technical support wasn't a problem. Yet it's not hard to find complaints about

HELP BY MODEM: ELECTRONIC BULLETIN BOARDS

Tired of tech-support gridlock? If you have a modem, you can use it to zip around the traffic on the hold queue. Almost all graphics board manufacturers maintain electronic bulletin boards from which you can download the most current screen drivers and utilities—and on which you can often post messages to tech support personnel. Most operate 24 hours a day, and all are free of charge, though you'll have to pay for the long-distance phone call, of course.

Before dialing, set your modem to its maximum speed (up to 2,400 bits per second), 8 data bits, 1 stop bit, no parity. If you have problems with these settings, try 7 data bits, 1 stop bit, even parity.

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Everex Systems Inc.	(415) 438-4650
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Hercules Computer Technology Inc.	(415) 540-0621
Orchid Technology	(415) 683-0327
Paradise Systems Inc.	(415) 968-1834
Renaissance GRX Inc.	(206) 454-0511

rudeness and lack of knowledge on the tech support lines. Carlen Hoppe reports mixed experiences. "One time it was good; I got a ROM update with no problem. But most of the time, the people just don't sound nice. The answers they give are things like 'I don't know about that.'" Ferguson is blunter: "Whenever I call

very satisfied, versus 50 percent overall. Warranty service suffers from long turn-around times. Bennett Price, a programmer/analyst for the University of California, San Francisco library, says, "The board went bad, and I sent it in to Paradise

number to get an RMA number. But they can't give it to you over the phone right there; they have to call you back."

Cathy Apphun, director of marketing for Paradise, says that the company is taking steps to improve its performance: "We're creating a group called Service One to respond better to end-user needs, which should be implemented next quarter. We're looking into a 48-hour turn-around for service, either at our service center in Irvine, California, or through local authorized service centers. And our technical support people are now instructed to transfer the customer directly to get an RMA if it's a hardware problem."

The consistent popularity of Paradise Systems cards indicates something beyond Western Digital's marketing clout. To judge from our survey respondents, those who buy Paradise get quality products that give little trouble. Yet, like many of its competitors, Paradise could stand some improvements in the technical support area. As Carlen Hoppe says, "Sure, I'd recommend them. As long as you don't have problems!"

CIRCLE 414 ON READER SERVICE CARD

Those who buy Paradise get quality products that give little trouble. But the company could stand some improvement in tech support.

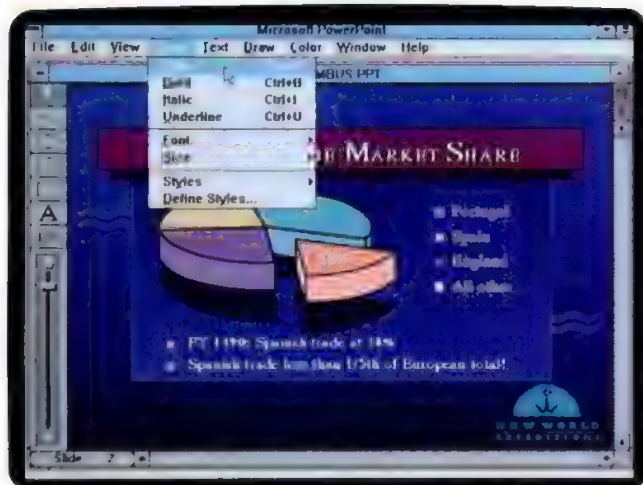
Paradise, I get people who don't know and don't care. I spoke to a lot of people, but I never got through to anybody competent." Bendik says, "I got the feeling that the right hand doesn't know what the left hand is doing. Getting in touch with the right person is a challenge."

TANGLED PROCEDURES

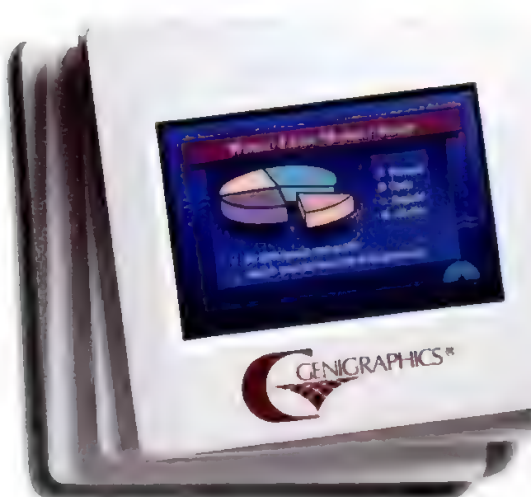
Repair service is also a source of some dissatisfaction, earning Paradise a lower-than-average rating. Only 44 percent are

for warranty service. It was gone 30 or 40 days! Fortunately, I still had the monochrome card that had come with the system, so I wasn't down all that time. For warranty repair, when all you're doing is basically swapping cards, that's appalling." Price also says that getting authorization for returns was an awkward process. "I had to call one number for tech support to find someone who could say that something is wrong and needs to be sent back. Then I had to call another

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by Rock Miller

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▼ ■ — Actual score ▲ — Average score □ — High-low range

Renaissance GRX is best known for its high-end graphics boards, which offer high resolution and high performance for CAD and other demanding applications. But it also sells in the regular PC market with its RVGA line of 8-bit and 16-bit VGA and Super VGA boards. The RVGA II board was rated highly compatible in *PC Magazine's* review of 800 by 600 Super VGA adapters (July 1989), and its Rendition II high-resolution graphics board won *PC Magazine's* Editor's Choice

SERVICE AND RELIABILITY GRAPHICS ADAPTERS

for 1,024 by 768 graphics adapters this year (April 10, 1990).

Though 82 percent of the Renaissance respondents called their boards very reliable, versus 74 percent overall, Renaissance boards do seem to experience more problems than average. 19 percent of the respondents reported problems with their boards, versus 11 percent overall, and 14 percent for VGA boards, which make up much of the Renaissance line. "I think the Rendition I Plus had a lot to do with that," says Vicki Crudo, manager of technical support for Renaissance. "Just as in any new product line, you have problems. But the Rendition II was virtually problem-free because of all we learned."

Louis Sullivan, for example, the president of Sullivan-Durand, a mechanical engineering firm in Phoenix, Arizona, says that his original Rendition board "just didn't work" with his AutoCAD system. After talking with Renaissance, however, he decided to pay the extra \$300 to \$400 to get the Rendition II, with which he is very satisfied. "It's one of the best boards I've owned. It makes a 20-MHz machine

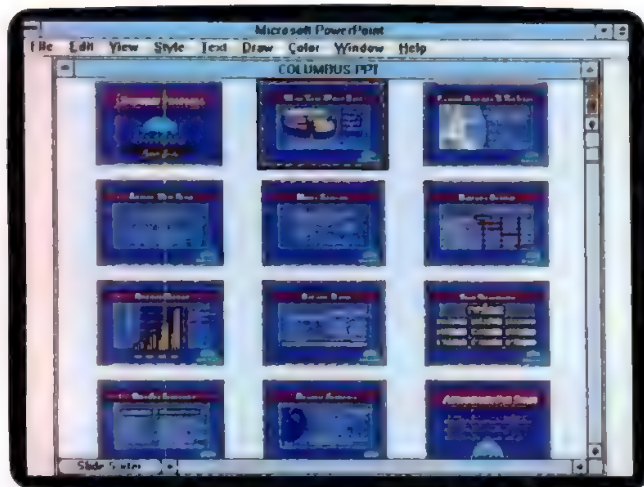
very acceptable, so you don't need to bump it up to a 25-MHz or 33-MHz machine." Sullivan says he has recommended it to three others. 85 percent of the Renaissance respondents say they would buy from Renaissance again, versus 77 percent overall.

GO TO THE DEALER

As befits its origins, Renaissance GRX sells many of its graphics adapters through authorized dealers and distributors specializing in the CAD market. Not surprisingly, the company prefers that dealers handle technical support and repair. It has even started an extra-cost "Dealer Direct Program," so that dealers can get guaranteed 3-hour tech-support response. Still, Renaissance GRX does have a technical support line for end users, and it does offer free BIOS and software updates like other manufacturers. Its warranty, however, is shorter than that of many its competitors: two years on its VGA boards and as little as one year on its high-end boards. Our survey respondents rate its technical support about average.

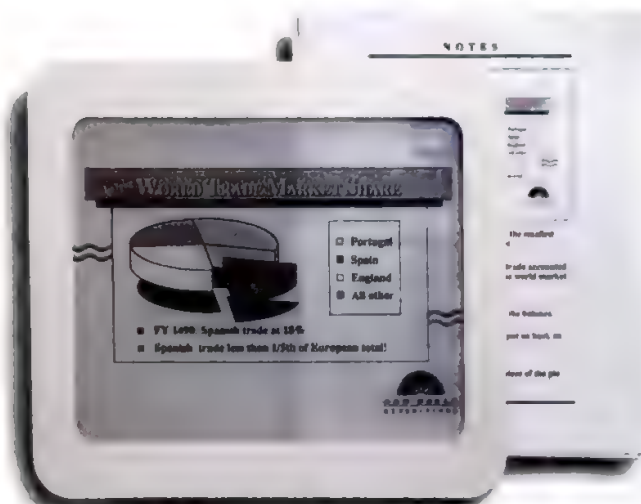
Though Renaissance currently offers free software updates, several users com-

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by Rock Miller

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▼ Actual score ▲ Average score □ High-low range

Though it's not as well-known as some of its competitors, STB Systems has been in business from the earliest days of PCs. It currently makes a full line of monochrome, EGA, and VGA graphics adapters at middle-of-the-road prices.

Our respondents rate their STB Systems graphics adapters safely average in terms of reliability, with a mean rating of 92—and with 72 percent rating their boards very reliable. The problem incidence is somewhat high, though, with 18 percent reporting problems, versus 11 percent of all respondents.

It's hard to tell exactly what the problems are. Relatively low severity ratings combined with a high number of occasions on which problems have rendered the boards impaired, however, may point to compatibility glitches. Bryan Leipper, a computer consultant in Reno, Nevada, for instance, reports consistent problems with mode switching on his VGA board. "When I'm using *Generic CADD*, which uses mode 17, I find I must set the mode first using STB's SETMODE utility. When I quit, I have to set the mode back to mode 7 twice in order to see anything. It seems to work okay with *Ventura Publisher*, though."

STB also attracts the common complaint about drivers for extended VGA modes, a problem worsened by the fact that it's not one of the best-selling cards. Ronald Pepler, a computer consultant and president of Affiliated Insurance Brokers of Palatine, Illinois, notes that his STB board "does have 512K of RAM and it's fast, but no one makes drivers for it. STB doesn't make a *WordPerfect* 5.0 driver for its maximum capabilities, though it does have a *Windows* driver. I

have no drivers, so the card won't do anything like what I want to do with it."

PROMPT BUT MIDDLING

When it comes to service and support, most respondents who have had problems are happy with STB Systems' technical support. About an average number of people rate themselves satisfied or very satisfied with technical support, and the tech-support hot line is perhaps a little bit above average in satisfaction ratings. Bryan Leipper, for instance, has praise for STB Systems' response to his problem: "I played a bit of phone tag, and I didn't get hold of a technician at first, but they did call back after a day. STB's response to the phone was prompt and appropriate."

Some respondents question the company's technical ability, however. Larry DeLeon, a programmer analyst with General Dynamics in Texas, for instance, suffered from a very peculiar problem using *Windows* in 1,024 by 768 noninterlaced mode, which caused his system to slow down drastically. "They sent me a new BIOS and two new translator chips, but the problem persists," he says. "I've got no complaint with the company. But they couldn't solve the problem." Bill Pfeil, co-owner of Kasilo in Rockton, Illinois, had similar things to say of his experience with persistent parallel port failures of his STB Chauffer monochrome card. "Service was good, but the problem was never resolved. In spite of the money-back offer (I declined; I like the card), I am very concerned about this company's ability to resolve conflicts."

Such problems may account for the relatively poor satisfaction ratings that respondents who have had problems give to STB Systems' repair service. Though rather few people have taken advantage of it, they give it well-under-average ratings. "Tech support is always an ongoing concern. We're always trying to bring new hires up to speed, and we're always trying to improve their technical ability," says Gary Keller, STB Systems' director of marketing. "But it's not always possible to help everyone, to solve problems every time."

Only 69 percent of the STB users say they will buy from the same manufacturer again, the lowest in the group of companies we reviewed. STB's graphics adapters are not unreliable, but their reliability and support are not top-notch.

plain of delays in getting the drivers for their favorite applications. Dr. Ronald Burnett, an author and educator from Springfield, Missouri, is one of them: "When I bought the board, they advertised that it came with all the drivers for *Ventura Publisher*," he says. "It did, but for *Ventura Publisher*, Version 1.1, not 2.0. I called tech support, and they said they would have drivers out in a month. But I still don't have them—and it's been about a year now."

Crudo admits that Renaissance had problems with drivers for the RVGA II. "The drivers were written by Cirrus Logic, and we had an extremely long delay on them. After they supplied us with one driver that was full of bugs, we had to get the source code from them. Now we demand the source code whenever someone outside writes drivers for us." She also notes that given the market for their cards, CAD drivers take precedence. "The Rendition II is a CAD market card, and we will have new *AutoCAD* drivers for it as fast as we can get them out," she says. But besides *Windows*, she notes, support for other programs such as word processors depends to a certain extent on customer requests.

SUCCESSFUL SERVICE

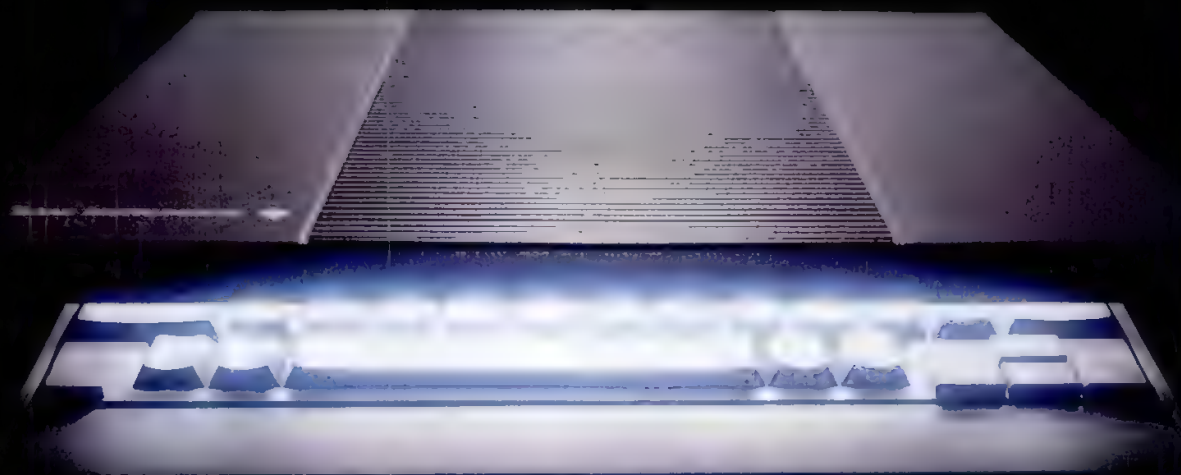
All repairs are handled by Renaissance at its factory, but the company encourages users to exchange failed boards at their dealers; it offers no mirror shipment or overnight shipment options to end users. Yet unlike other manufacturers who rely on dealers, Renaissance fares about average in satisfaction with repair service. This may be because many of its dealers are full-service organizations rather than mere sales depots. Louis Sullivan, for instance, says, "We have a rep here in town at Design Automation, from whom we bought the entire system, and we've been very happy with them." Renaissance claims a 48-hour turnaround time on repair service and can cut that down to as little as one day through cross-shipping arrangements with dealers.

Whether the Renaissance dealer-based service strategy will continue to work as well for its mass-market VGA cards as it has for its high-end products is an open question. But our survey respondents indicate that the company makes high-quality products and supports them well. If you're in the market for a company, Renaissance looks like a good choice.

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* SVGA 1024 x 768 interlaced

* Tower is a registered trademark of NCR Corp.

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SVGA-Color*	\$940	\$1010	\$1200	\$1260	\$1759
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- 8 Slot motherboard design (5 16Bit & 3 8Bit)
- Medium foot print case with 6 Disk Drive bays

Options:

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- Full Size Tower Case with 8 Disk Drive bays
- Mini Size Tower Case with 4 Disk Drive bays
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- Custom configurations with Name Brand peripherals of your choice

PC BRAND 386/25

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VGA-Color	\$930	\$1120	\$1180	\$1679	\$2280	\$3070
SVGA-Color*	\$1010	\$1200	\$1260	\$1759	\$2360	\$3150
Portable VGA	\$2640	NA	\$2890	\$3389	NA	NA

* SVGA 1024 x 768 interlaced

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VGA-Mono	\$679	\$869	\$929	\$1428	\$2029	\$2819
VGA-Color	\$930	\$1120	\$1180	\$1879	\$2280	\$3070
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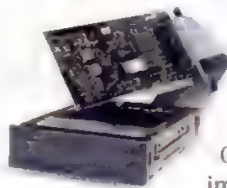
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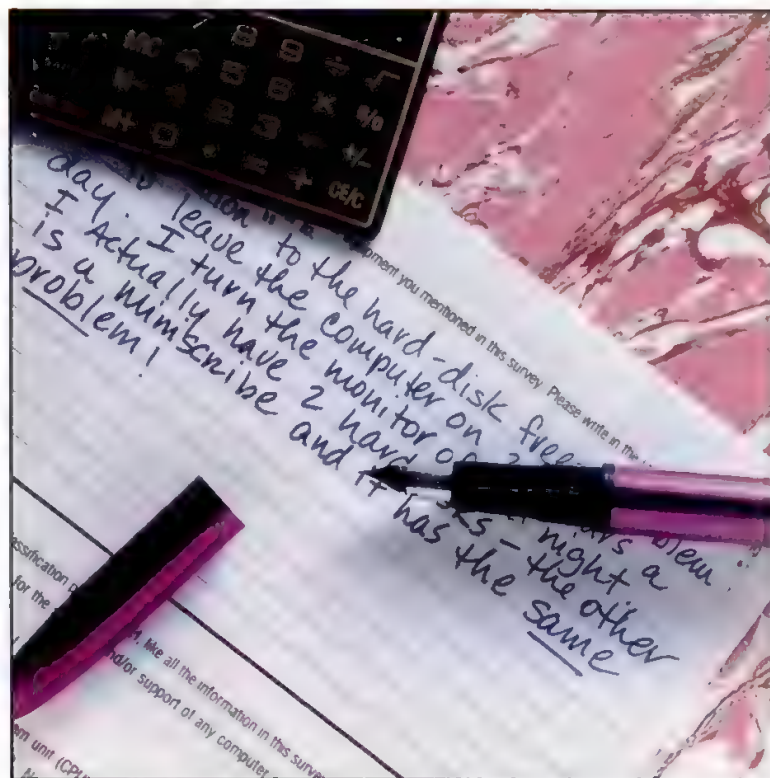
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If you stop for a minute and really think about what hard disks do and how they do it, it's easy to be amazed—and frightened. With platters spinning at 3,600 r.p.m. and read/write heads floating on cushions of air only millions of an inch above the highly sensitive magnetic media, disaster seems only a micron away. Add to that the knowledge that when a hard disk goes south it may take megabytes of spreadsheets, databases, and documents with it, and you start to shudder whenever your PC buzzes in an unfamiliar way.



PHOTOGRAPH BY PETER NEUMANN

HARD DISKS DRIVE CAREFULLY

What a relief it is that the 16,285 people who told us about their hard disks give an average overall reliability rating of 89 (out of a possible 100) to all hard disks. 21 percent of all respondents have had some kind of problem with their hard disks, but given that the average age of the disks is 18 months, that figure is not



Although hard disk crashes are a threat to every PC user, survey respondents tell us that their disks have been generally reliable and that technical support, though sometimes difficult to contact, can be a big help.

HARD DISKS

surprisingly high. The average severity of a typical problem was rated at 67 and of the disks that have had problems, the average number of times they were impaired or unusable was four. 81 percent of the respondents would buy another hard disk from the same manufacturer.

ACQUISITION AND PROTECTION

The way you purchase your hard disk determines who you will turn to for support and repair if trouble should occur. If the hard disk comes as part of a PC bought through a dealer, chances are that the dealer will be the first person you call when something goes wrong. For example, many Compaq computers come with disks manufactured by Conner Peripherals, but you'll probably never call Conner to get help, and if you call Compaq, they'll tell you to go to your dealer.

If you're improving your current PC or assembling a design-your-own system,

thereby getting your hard disk through the popular and relatively inexpensive mail-order channel, you'll probably find your purchase protected through some kind support-and-warranty combination offered by both the mail-order firm and the hard disk manufacturer. If the CompuAdd system, purchased with a Seagate hard disk, goes down you return it to CompuAdd. Both Seagate and CompuAdd have warranties and tech support phone lines.

Mail order is not to be feared, although there's a definite advantage in knowing what you want before you call. In a PC MagNet survey taken late last year ("Hard Disks by Mail," *PC Magazine*, June 27, 1989), 88 percent of the respondents said they would buy from the same mail-order firm again, but only 60 percent rated the knowledge of the salesperson as good or excellent. Thousands of survey respon-

dents related tales of both delight and disaster about their mail-order experiences. One big point of confusion: Whose warranty is it, anyway? Who do you call first when trouble strikes, the mail-order firm or the manufacturer?

When you're making informational calls about hard disks, you will find that manufacturers and dealers will probably claim a mean-time-between-failure (MTBF) rating for the disk. Fujitsu, which manufactures a line of high-end hard disks (172MB to 1.2 gigabytes) not represented in this survey, advertises an industry-high 200,000-hour MTBF rating for its products, and backs that up with a five-year warranty. MTBF ratings, while historically optimistic (and therefore somewhat meaningless), are fun to ask about when you're shopping, but don't take them too seriously unless they come with a guarantee. Most manufacturers will claim an MTBF of 25,000 to 50,000 hours.

HEAD TO HEAD: COMPANIES COMPETE ON SERVICE AND RELIABILITY

The highest reliability rating, a score of 94, was given by our survey respondents to both Toshiba America and Plus Development. In fact, the Plus Hardcard 20 was rated the most reliable of any hard disk model, scoring a 97. The lowest reliability rating, an 87, goes to MiniScribe. Plus Development comes out on top again when 92 percent of

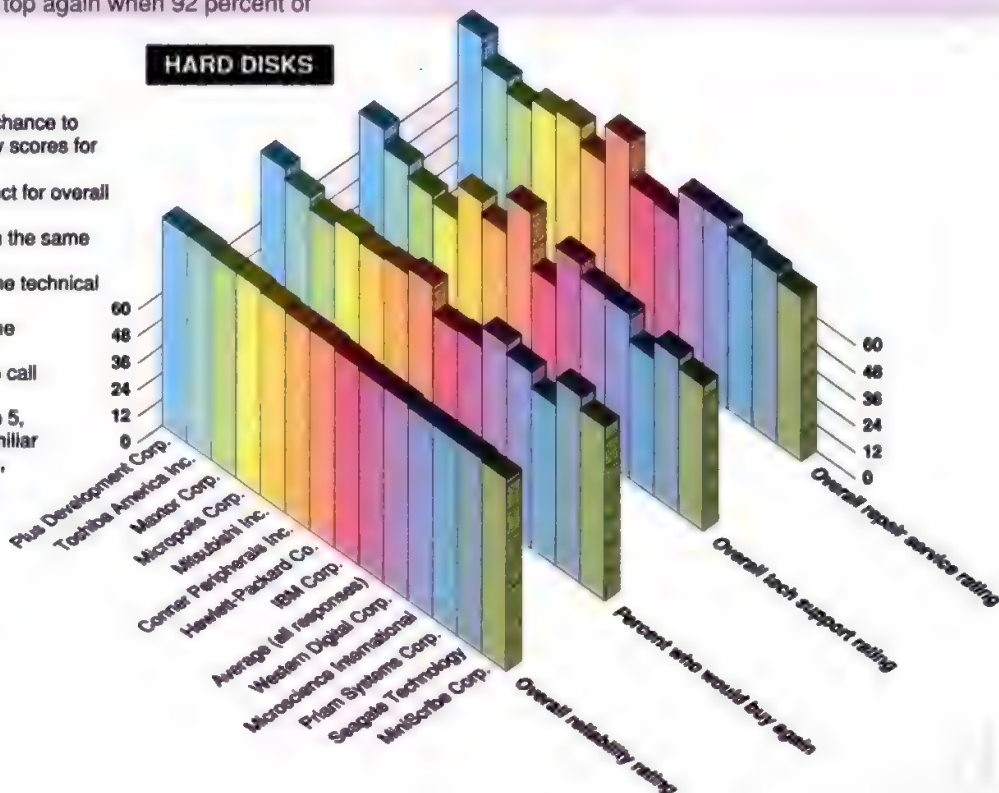
the Plus respondents say they would buy from Plus Development again. When it comes to technical support and repair, however, no hard disk vendor can beat Hewlett-Packard, though once again, Plus Development ties on the repair score with an 88.

HARD DISKS

This 3-D bar chart gives you the chance to compare at a glance the company scores for four questions:

- How would you rate the product for overall reliability?
- Would you buy a product from the same manufacturer again?
- How satisfied were you with the technical support you received?
- How satisfied were you with the repair service you received?

The first question and the last two call on respondents to give a rated response based on a scale of 1 to 5, which we converted to a more familiar 1 to 100. For the second question, though, each result indicates the percent of respondents who answer yes. Note that answers to the first two questions come from all those responding for a given company or product. For the last two questions, however, those answering are a subset of the total respondents—only those persons who tried tech support or had a repair problem.



HARD DISKS

PREVENTIVE MAINTENANCE

Of course, there are plenty of ways to keep your hard disk healthy as it spins through its daily chores. A whole disk protection and maintenance subindustry thrives because people realize that while their monitor or printer is easily replaceable (they can always simply throw it away and get a new one), their hard disk can take a lot of valuable data with it when it dies.

SpinRite II from Gibson Research and *Disk Technician* products from Prime Solutions are examples of software packages that analyze, clean up, defragment, and monitor your hard disk. Many survey respondents mentioned using products like these as part of a periodic maintenance routine for their hard disks. General utility packages like *The Norton Utilities*, *The Mace Utilities*, and *PC Tools Deluxe* also include some disk maintenance options, and you can download free disk utilities from PC MagNet as well.

When you buy a hard disk, you should ask if it comes with a copy of Ontrack Computer Systems' *Disk Manager* (as all Seagate hard disks do). *Disk Manager's* job is to help you get your hard disk off to a good start by guiding you through the formatting process without the hassle of DOS's inscrutabilities.

If real tragedy strikes and you're willing to pay any price to retrieve data from a dead disk, there are services that will go to any length, including hard disk surgery performed in clean rooms, to save your disk (see "Back from Beyond: Last-Ditch Data Recovery").

SURVEY HIGHLIGHTS

A number of well-known hard disk manufacturers, including CDC, Core International, Rodime, Quantum, and Tandon, did not receive a large enough number of responses to make the findings about their products statistically valid. Of the 13 manufacturers we report on, the one mentioned most often was Seagate. In fact, 44 percent of all the hard disk survey responses (over 7,000) were Seagate-related—a reflection of its market dominance. MiniScribe (which has recently been acquired by Maxtor) was a distant second and IBM third.

Do any real winners emerge from the statistics the hard disk survey yielded? Plus Development, maker of the Hardcard series of hard disk cards, proves to have a surprisingly loyal, almost fanatical, following. Its Hardcard 20, a 20MB

hard card that's just about obsolete, garnered an astonishing reliability rating of 97—the highest of all hard disks—and 96 percent of Hardcard 40 users said they'd buy from Plus again. You can read much more about Plus Development and all the other leading hard disk manufacturers in the detailed analyses that follow.

"The one way to ensure end users are getting the support they need is to continually train our distributors."

And as you relive the moments of horror suffered by some of the survey respondents who have survived to tell their tales, please acknowledge the unstated message: back up your hard disk often. That's the simplest thing that you can do to take all the suspense out of your computing, and make using your hard disk safer than the game of Russian roulette that it sometimes threatens to become.

Conner
Peripherals Inc.

by Carol Levin

COMPANY SCORES



3081 Zanker Rd.
San Jose, CA 95134
(408) 433-3340

Actual score Average score High-low range

Perhaps the youngest fleet of hard disks in service is from Conner Peripherals, which rates equal to competitors on the reliability front and captures a loyal customer base. Judging on an average usage of eight months, Conner falls in the middle with five manufacturers scoring just slightly higher and seven scoring the same or just below in reliability. But in profitability, Conner's CEO—Finis Conner, also a co-founder of Seagate—has spearheaded a remarkable rise, making the company a

leading OEM for notebook, laptop, portable, desktop, and workstation hard disks. One of the company's largest customers is Compaq.

FEW COMPLAINTS

Only four manufacturers had a lower incidence of problems than Conner. Only 16 percent of the Conner respondents had a hardware, service, or repair-related prob-

lem, compared with the overall average of 21 percent. In almost 90 percent of the Conner cases, these problems resulted in the impairment or unusability of the hard disk. The average score on this measure for all hard disks was a significantly lower 73 percent.

Further investigation into the nature of these problems indicates that the number of Conner hard disk owners who did have serious problems is above the average. No one problem was remarkable; rather, the range of maladies is typical of hard disks—power and disk controller problems, read and boot errors, and temperature-related problems.

A TECHNICAL SUPPORT CHALLENGE

Conner users scored technical support and repair service as comparable to the overall support and service scores of 69 and 75, respectively. "The one way to ensure end users are getting the support they need is to continually train our distributors," says Howard Wing, marketing director at Conner. "We have the mechanisms in place to support our customers and find that this is an important and integral part of our strategy," Wing adds. This strategy includes one-day training sessions that focus on installing drives and resolving problems held at regional offices or service arms of distributors, a new technical support line staffed by three technicians, a four-page "quick fly" installation guide on how to install disks and set switches, and five worldwide service support centers.

From the end-user's perspective, challenges do remain. John Lin, a programmer with Betacet Designs in Chicago, contacted Conner technical support to help identify the source of crashes on the



HARD DISKS

Conner hard disk installed in his 386 clone. After making additional calls to the motherboard and BIOS manufacturers and enduring bouts of finger-pointing, he fixed the problem. His experience draws a valid point: none of the manufacturers he contacted were well informed about compatibility issues. "They didn't find the problem important enough to have strategic alliances with other companies to address and resolve problems," Lin says. "At the very least, it's the obligation of all parties concerned to provide news so people can make informed choices that will allow them as corporate users to make decisions about whether these products should be used or not."

He discovered there was a handshaking problem when the disk performed reads. "Certain signals would get locked, and it would take 10 to 15 seconds to resume processing," Lin says. He explains that Conner uses a nonstandard interrupt protocol that is not supported by major BIOS manufacturers, particularly AMI and Phoenix. Lin updated his system to AMI BIOS, Release 1.10, that solves incompatibility with EDI drives and has since standardized exclusively with Con-

ner hard disks on his LAN.

An impressive 80 percent of the respondents were very satisfied with Conner's technical support hotline, which scored well above the average. Bill Driskell, a marine biologist and independent computer consultant in Seattle, was upgrading his system with a 100MB hard disk. "The setup menu doesn't exactly describe the Conner disk. It's something about the number of tracks, sectors, and heads," he says. Driskell was advised by his dealer but things were bombing. After a call to Conner, things almost worked. "Conner was helpful, but they didn't know what system I was looking at and what choices I had," he says. It took two days to resolve the installation and setup ambiguities.

THE BOTTOM LINE

Customers go back to Conner. 84 percent of the respondents now using a Conner hard disk will stick with Conner—loyalty that's slightly higher than other hard disk manufacturers. Here's why: "Great performance for the price. The Conner disk

seems faultless," says Steve Landsman, vice president of Landsman Capitol Associates in Chicago. Kevin Hawkins, a system administrator at AT&T in Maryland, upgraded from a 40MB to a 100MB Conner disk. "It has a quick IDE interface and is extremely quiet. It's fantastic," he says. Thomas Celentano of MicroBiz Corp. in New York, says his Conner disk is "real fast—26 or 27 milliseconds—and it seems that fast."

CIRCLE 417 ON READER SERVICE CARD

Hewlett-Packard Co.

by Carolyn Falconer

COMPANY SCORES



19310 Pruneridge Ave.
Cupertino, CA 95014
(415) 857-1501
(800) 752-0900 (sales)
(800) 835-4747 (technical support)

▲ Actual score ▲ Average score □ High-low range

NUMBERS YOU CAN TRUST:
HOW MUCH IS ENOUGH?

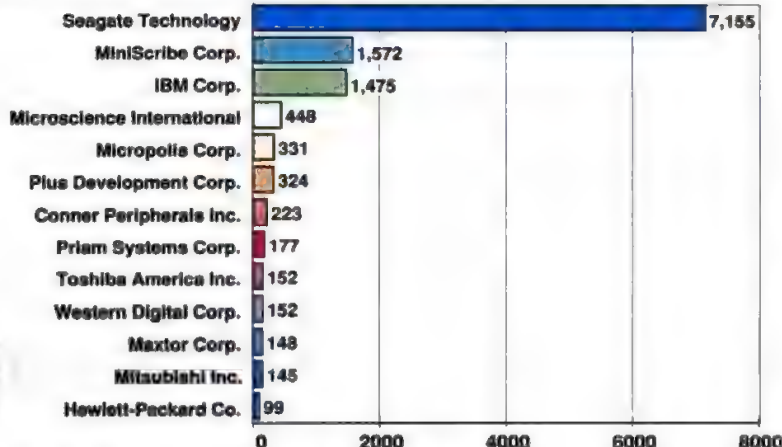
Survey respondents make it clear that when you're talking about hard disks, you're talking about Seagate Technology. The leading manufacturer was mentioned by 44 percent of the hard disk respondents. MiniScribe Corp., which has recently been acquired by Maxtor Corp., drew the second largest response.

This chart displays the number of responses each hard disk manufacturer received in our March 27 Service and Reliability Survey. In this issue, we review manufacturers that garnered 75 or more survey responses, the minimum number required for the results to be reliable. Where companies of special interest with fewer than 75 responses are reviewed, their ratings should be used with caution because of the small base sizes.

RESPONDENT BASE

HARD DISK MANUFACTURERS

NUMBER OF RESPONSES PER COMPANY



With over 11,000 products ranging from calculators to chemical analysis equipment, Hewlett-Packard has grown from its humble beginnings in a California garage to one of the 50 largest industrial corporations in America. The company's background in scientific applications enabled it to make the logical move into the computer business in 1966; that business now accounts for a major portion of the company's sales.

Users of Hewlett-Packard hard disks who responded to our survey give HP high marks for both reliability and service. HP provides service to all of its customers following purchase, but premium service is available for those who choose to purchase a support contract from the manufacturer. The perks for the support contract customers include a 24-hour, toll-free technical support number, in addition to shipping replacement parts to contracted customers before receiving the damaged item. Technical assistance can also be obtained via a bulletin board service (HP SupportLine).

Because Hewlett-Packard registers slightly above average in hard disk reliability, you would expect its hard disks to experience fewer problems than other

HARD DISKS

disks—and it happens to be the case among our survey respondents. According to the HP respondents, their disks have had approximately half the overall problem occurrences of the average hard disk. 12 percent of the HP users report a problem, while the average for all hard disks is 21 percent. A spokesperson for Hewlett-

Hewlett-Packard's technical support and repair service at 88—19 and 13 points over the average, respectively. That's the highest technical support rating for any hard disk manufacturer, and only Plus Development has an equivalent repair

turers beat IBM in the incidence of problems. This track record gets even better, with a significantly lower than average number of problems leading to impairment or unusability during the past year. On this measure of reliability, no other manufacturer performs better than IBM.

Most Hewlett-Packard hard disk users who responded to our survey are pleased with the service and support they receive from Hewlett-Packard. And the hard disks score 9 points above average for reliability.

Packard attributes the low problem incidence to the presence of an extensive quality control program. This program has enabled Hewlett-Packard to complete a 10-fold quality improvement scheme three years earlier than originally planned.

Most HP hard disk users who responded to our survey are pleased with the service and support they receive from Hewlett-Packard. But how reliable are the actual hard disks? 92 percent of the respondents claim their disks have lived up to original expectations, a figure nine points above the average score for all disks. 85 percent say that the disk suits their current needs and most expect it to continue meeting their needs for an additional average of 31 months. Although Gerald Litt, a research fellow at E.I. DuPont in North Billerica, Massachusetts, expects his Hewlett-Packard disk to remain useful for the next year, but he won't be purchasing his next computer from the firm. Litt states, "Hewlett-Packard's equipment is very incompatible. I want to upgrade my hard disk with an IBM hardcard, but the BIOS is incompatible and I can't use anything but HP hardcards."

WHERE TO REPAIR

Repair for Hewlett-Packard hard disks is available through both the manufacturer and its dealers, and HP requires dealers to stock replacement parts to remain an authorized outlet. It also provides dealers with a certification and training program that includes self-paced documentation and video courses. In addition, HP keeps dealers aware of new technology through HPNN, the Hewlett-Packard News Network. Survey respondents appreciate this level of commitment. They rate both

satisfaction rating.

Phillip Wills, a workstation support manager in the MIS department of NCSI in Rockville, Maryland, suffered hard disk problems and contacted his dealer. Wills is satisfied with the service he received and has already purchased more HP equipment. He states, "We're a Hewlett-Packard office. They're fine machines."

CIRCLE 418 ON READER SERVICE CARD

IBM Corp.

by Carol Levin

COMPANY SCORES



Contact your local authorized IBM dealer.
(800) 426-2468 (dealer information)

—Actual score —Average score —High-low range

IBM will always sell a lot of hard disks, even if people don't request them in the same way they request a Seagate or Maxtor disk. After all, the majority of IBM's business is in the corporate world where people use what's given to them, whether they like it or not.

Ranking third in responses behind Seagate and MiniScribe, IBM hard disks drew opinions from 1,475 users. 14 percent report a problem, which is about one-third less than the overall average on this reliability measure. Only three manufac-

TOO DETACHED

In overall reliability, IBM is head to head with the competition but falls short when it comes to customer loyalty. 81 percent of all respondents would buy again from their current hard disk manufacturer, but 74 percent of IBM users indicate they would stay with IBM. Only Priam scores worse, and others score much better.

Considering what users like Rodney Shimon of CEP Enterprises in California say about support and service, this lack of loyalty is not so surprising. "IBM seems too detached, and when you use its hotline for advice, it refers you to the dealer who sold you the unit. They don't seem to know any more than the owner does. Also, it is very difficult to find information on upgrading the unit. I like the Model 50, yet I feel that IBM doesn't seem to grasp what individuals need from their computer use," he says.

John Robison, logistics methods specialist at General Electric Aircraft Engines Business Group in Cincinnati, had no complaints with service, he just expects more from IBM. He's had problems ranging from bad 3.5-inch floppy disk drives to fuzzy and jittery monitors and PC-DOS commands that do not operate under the VGA system. "Service was fast because we were under warranty with BusinessLand at the time, but it was a hassle," he says. Robison heard that the problems he had were common, and that IBM had given the dealer a lot of monitors to compensate for the bug it endured.

DEALERS PREFERRED

Overall technical support scores among all manufacturers range from a low of 61 to a high of 88. Respondents gave IBM a score of 63. Repair service fares no better, but those scores are higher than for technical support across the board (75 is the average). But compared with all other manufacturers, IBM comes in last with a score of 70.

In response, IBM says, "Our surveys show that we have a high level of service satisfaction with our product offerings." (The Desktop PCs section of this issue discusses IBM's dealer channel.)

CONQUERING DISK BOOT FAILURES

by Winn L. Rosch

Diagnostics and messages designed to help you identify potential problems are built into every PC, but often the information provided is vague. A message stating a drive failure only confirms your worst fears. However, a little investigating can help you pinpoint disk boot-up difficulties and, in many cases, resolve them.

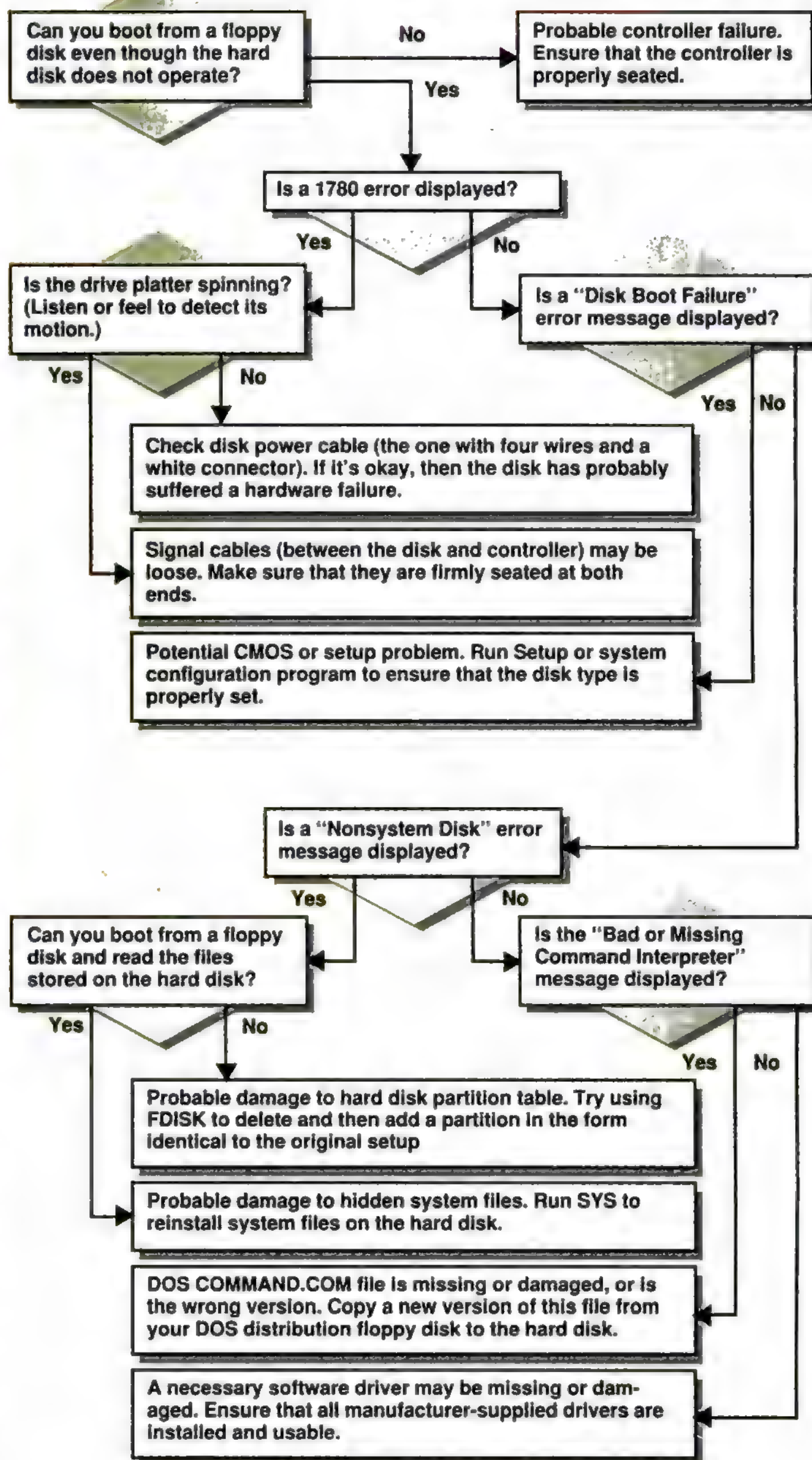
These guidelines make two assumptions. One, that you have not installed any new hardware or physically moved the machine. If you have, the changes you made are the likely causes of the difficulty. Take a step backward and restore your system to its original configuration. If it functions properly again, you found the problem. If that is the case, go through the installation again and verify that everything is properly set up.

The second assumption is that you've checked all the obvious things—that you haven't left a floppy disk in the A: drive, haven't unplugged your external hard disk, or haven't forgotten to put a cartridge in your Bernoulli or other removable media drive.

Once you've gone through the preliminaries, this decision guide will help you zero-in on common hard disk problems and advise you on what you can fix (and how) and what you cannot.

Satisfaction with repair service covers the whole spectrum. The "I'm not wedded to IBM, but probably will go back" attitude is reflected by Patricia Phelps, data processing manager at a property management company in West Palm Beach, Florida, whose crippled IBM hard disk was replaced with the help of IBM customer service. Her case seems to be exceptional. "They made a mistake and put me through to a knowledgeable man who solved my problem immediately. That phone number never worked again! They thought I was a dealer."

Now she says she can't even get a number and has had to use a third party. "So few of the dealers actually know what to do," she says. Pleased with the



HARD DISKS

Maxtor Corp.

by Stephanie Izarek

COMPANY SCORES



211 River Oaks Pkwy.
San Jose, CA 95134
(408) 432-4482

Actual score Average score High-low range

technical support she's received from other companies, Phelps says, "I don't understand why a company the size of IBM cannot or will not furnish support services for their equipment. If a little company can go to extremes, why does IBM put it off on other people? That's irritating."

Others, like Rob Ellin, western sales manager of Envirosafe Services of Idaho in Boise, had no trouble contacting IBM through CompuServe and found out that Microsoft had written certain routines around the PS/2 model 70-061 BIOS resulting in fatal errors when attempting access to the internal 3.5-inch disk. Ellin wasn't satisfied initially because both Microsoft and IBM at first denied the problem. "And then they didn't want to fix it. IBM eventually did fix the problem, but a fix wasn't published for about two months," says Ellin.

For Peter Dow, a Connecticut-based consultant specializing in computerized accounting systems, service has been reliable. "We're on a maintenance plan, and they're quite easy to reach. They were out there the next day, had a hard disk with them and just replaced it. Response was really good," says Dow.

ENDURANCE TESTED

For some users, it's about time to shop around to replace their veteran hard disks, which are about two months older than the overall average of 18 months. Among all manufacturers, IBM has the largest percentage of users who say their current hard disk does not meet their needs.

Three-quarters of IBM respondents report that their hard disk is sufficient for their needs, but other hard disk manufacturers achieved higher percentages in this category. These statistics may be partially explained by the fact that so many old XT and ATs are still in service, and early PS/2 Model 30s, 50s, and 60s had such small, slow hard disks.

For some, the choice of a hard disk manufacturer is clear. Robert Irvine, controller at Sun Chemical in Philadelphia, has IBM hard disks ranging in age from three months to two-and-a-half years. "Fortunately, we haven't had any problems and have not had any reason to call technical support or service," he says. As for Ed Swierc, a computer consultant in Colorado Springs, "The hard disk is evidently indestructible. It has been powered on and off at least 12 times a week for the past 43 months."

CIRCLE 419 ON READER SERVICE CARD

Maxtor Corp., located in San Jose, California, manufactures complete lines of high-capacity hard disks and optical storage products. On April 4, the U.S. Bankruptcy Court in Denver, Colorado, approved Maxtor's bid for MiniScribe's assets, and on June 30, began shipping the Mini-Scribe line under the name of Maxtor Colorado Corp.

"Maxtor is a company that strives to remain a key player in the hard disk market," says an enthusiastic Maxtor representative. Maxtor's recent acquisition of Mini-Scribe proves that intention—with the addition of MiniScribe's line of hard disks, including the new one-inch high 3.5-inch disk, Maxtor is now the second largest disk drive company.

Like many hard disk manufacturers, Maxtor sells the highest volume of its disks through the OEM channels. But

all hard disks. The number of Maxtor respondents who say they would purchase another hard disk from Maxtor, 82 percent, was also right on average. This is a little surprising since the number of people reporting problems with their Maxtor disks was only 16 percent, slightly lower than the average. Brian Wong, vice president of Roth and Wong in San Mateo, California, says "I have had absolutely no problems with the Maxtor XT-1025. It has been a very reliable drive, and I've been using it for over a year. In combination with the DTC 1:1 controller, I get great performance results."

ABOVE AND BELOW AVERAGE

Why then have survey respondents given Maxtor only average ratings? The mitigating factor here may be that Maxtor respondents rated the technical support at 64 (an average score) and the repair service at 71, which is slightly below average. Although the incidence of problems is low, when they do occur it can be a painful experience.

John Fobel, vice president of Rancho Technology in Cucamonga, California, says, "When my Maxtor 100MB SCSI drive was not being recognized by certain software, I called Maxtor. It was a strenuous experience with many phone calls and the help was ineffective, so I decided to just switch my software. The drive works okay now, and I probably would purchase another drive from Maxtor. However, I would not attempt to deal with Maxtor's support again."

The average severity rating of disk problems is also a good indicator of qual-

"When my drive wasn't being recognized by certain software, I called Maxtor. It was a strenuous experience with many phone calls and the help was ineffective, so I decided just to switch my software."

ity and satisfaction, and once again Maxtor receives an average rating of 64 on a scale of 100. Apparently, the problems that the respondents have encountered with Maxtor products are not severe enough to make them avoid buying from Maxtor again, but they are bad enough to keep Maxtor from earning a high satisfaction rating.

Survey respondents rated Maxtor's reliability at 93, which is higher, though not significantly higher, than the average for

Several of the respondents did report

HARD DISKS

Micropolis Corp.

by Stephanie Izarek

COMPANY SCORES



21211 Nordhoff St.
Chatsworth, CA 91311
(818) 709-3300

▼ Actual score ▲ Average score □ High-low range

Developing a balance of product reliability and customer satisfaction with support services is the aim of most hard disk

companies, and Micropolis Corp. is not an exception.

Micropolis is a California based company that has been manufacturing high-quality hard disks for the past 13 years. According to company spokesperson, Craig Ringuette, the largest portion of its sales presently come from OEM channels, but there is a recent increase in sales from the direct market. Micropolis feels that this shift will result in increased volume and therefore will demand some company revisions to adequately handle the influx of new business.

Micropolis offers several complete lines of hard disks with capacities ranging up to 760MB, 1.2GB, and 1.6GB. The range of interfaces is equally extensive, covering ST-506 to ESDI and SCSI.

As the company scorebox shows, users of Micropolis hard disks are generally satisfied with the quality and performance of their disks but seem to be disappointed

problems of complete disk failure, and were required to send the unit back for repairs. However, once the units were replaced, they functioned adequately. According to Stapleton, the majority of the problems Maxtor sees occur with units that have been in use for a long period of time and have reached their functional limit. This point is in line with the findings of our survey.

Maxtor employs a very large technical staff with 60 members, some of whom have come over from MiniScribe. Presently, Maxtor does not have a bulletin board service, but it is looking into a system. In fact, Maxtor is going to be enhancing its phone support and repair service in anticipation of increased volume owing to the MiniScribe transition. MiniScribe disks presently under warranty will be serviced by the Maxtor Colorado Corp. division of Maxtor.

CIRCLE 420 ON READER SERVICE CARD



BACK FROM BEYOND: Last-Ditch Data Recovery

by Gus Venditto

The traditional solutions to fixing a flaky hard disk are always harsh and often unbearable.

Formatting, both high and low, may stop erratic behavior for a while, but it can't help recover inaccessible data. The file recovery tools in leading disk-maintenance programs like *The Norton Utilities*, *PC Tools Deluxe*, and *The Mace Utilities* won't be of any help either if the problem is mechanical rather than logical.

OnTrack Data Recovery in Eden Prairie, Minn. ((800) 872-2599), is in the business of recovering files that seem lost beyond all hope.

Its services aren't cheap—the minimum fee is \$200 for a floppy or hard disk analysis before it will even make a diagnosis, and the actual recovery will cost hundreds more depending on how much work the job requires. Repairs are based on hourly work, and beyond the \$200 diagnostic fee, the company guarantees that you'll get your data.

Typically, the total bill for a recovery operation is between \$500 and \$800 and takes three days. Once you place a call, OnTrack faxes a contract, outlining their terms. Once they receive your disk (and most disks are sent via over-

night services), the analysis takes 24 hours. They then call you with the diagnosis and give you a price for the completed job; in many cases, only partial recovery will be possible and they'll give you their best estimate. If they think it's hopeless, there's no further charge. If they quote a price, and then don't succeed in retrieving what they expected, you won't be charged an additional fee.

Paul Mace Software ((800) 523-0258) offers a similar service with comparable terms, but OnTrack excels

You typically receive your files back on floppy disks, although upon request, OnTrack will put the data on a new hard disk (either sent by you or supplied by them).

Of course, the people at OnTrack aren't miracle workers. We sent them a 3.5-inch disk that was prompting "General Failure" messages and had confounded *PC-Tools Deluxe's* DiskFix utility. OnTrack couldn't recover anything; their diagnostics found only a series of DOS F6-writes. That may be indicative of what happens in

Hard disk data recovery operations range from software diagnostics and part replacements to total reconstructive surgery in a clean room.

in the scope of its hardware surgical operation.

The recovery operation ranges from software diagnostics and part replacements to total reconstructive surgery in a clean room. About 35 percent of the cases require time in the clean room, where repairs range from head replacement to complete platter transplants.

any lost data situation: attempts to recover files can often make a situation worse.

OnTrack claims to have a better than 90-percent success rate at restoring some of the data on the disks it receives. If you've got critical data on a damaged disk, those are probably the best odds you can hope to hear. ■

The numbers outside.

406TM

386TM

386TM 5+

HARD DISKS

with the support they receive. Micropolis respondents give the company a score of 93 out of a possible 100 for product reliability, which is average compared with the other companies in the hard disk category.

PROBLEM INCIDENCE

Although the incidence of a problem occurring was also average, only 65 percent of those reporting a problem with a Micropolis hard disk had it occur within the last year, which is slightly below average. On the other hand, 15 percent of the Micropolis respondents have been using their disks for only 12 months.

The respondents who reported problems with a Micropolis disk rate the average severity of their problems at 53, which falls well below the overall average and means most of the problems that do occur are relatively minor. The most frequently reported problem was bad disk partitioning, but most users were able to resolve this problem on their own (with the help of some software).

Micropolis does offer several alternatives for technical support and repair. It offers free telephone support to all users between the hours of 7 A.M. and 6 P.M. Pacific time, and a 24-hour public bulletin board service that posts answers to common questions and allows users to converse in a message area. If your problem is very difficult you may address it to one of the representatives who will try to reply within 24 hours. In addition, Micropolis offers a one-year parts-and-labor warranty and will pay for shipping charges back to the customer if a replacement disk is necessary.

Nevertheless, the respondents' rating for technical support was a 61, which fell slightly below the average of all hard disk manufacturers. It is important to keep in mind that since Micropolis caters mainly to the OEM market, end-users may not be dealing directly with Micropolis for technical support. However, of the total number of people who found it necessary to deal with technical support, the highest percentage dealt with Micropolis.

According to Webster Griffith, a program manager for TASC in Reston, Virginia, "Micropolis' technical support staff was completely ineffective. My call was rerouted several times and most of my phone time was spent with the regional sales manager, who knew nothing about the operation of my 330MB drive. He actually suggested that there was nothing

wrong with my drive, and that I should consider buying a new controller—imagine that."

Another respondent, Rich Sartore, a systems coordinator for Skipper's Inc. of Ocala, Florida, had a similar experience. "The Micropolis tech support people have

There are no surprises to report about Microscience's line of 5.25-inch and 3.5-inch hard disks, a reliable line of 11 models aimed at the PC, low-end workstation, and laptop markets. Formed in 1982 as an aftermarket supplier, Microscience was the first to introduce a half-height Winchester hard disk and now claims 45 percent market share in the 5.25-inch, half-

Microscience says that while the 5.25-inch disks are an established product line and have few problems, the newness of the 3.5-inch disks and controllers has caused some technical problems.

been curt and almost rude. After placing two separate calls, I finally got some help, and a very sarcastic 'Are you satisfied NOW?' Still, it's a good drive and I would purchase another from Micropolis, but I would call my dealer—who was much more helpful—for technical support."

According to Ringuette, "The entire company is now under review. Major revisions are presently being discussed for all areas of the company and will most likely be implemented within the next 12 months." Ringuette could not give details as to what the actual revisions will be, but he stressed that improved technical support is of very high priority. The 85 percent of respondents who say they would buy from Micropolis again may soon find out whether the company achieves its goals.

CIRCLE 421 ON READER SERVICE CARD

height, 44MB, 28-millisecond arena. Now a leading supplier to the top ten clone manufacturers, Microscience products are found across the U.S., Europe, and the Far East. Here's what almost 450 users think about their Microscience hard disks.

In both overall reliability and problem incidence, respondents say Microscience is competitive with other manufacturers. 20 percent of Microscience users report a hardware, service, or repair-related problem incidence, which is comparable to the 17 percent of all 5.25-inch disk users in the survey who report problems. A possible explanation for the company rating's being higher than the individual model's rating could be the influence of 3.5-inch disk users, a segment of users too small to warrant separate ratings but a factor nonetheless in the company scores.

Of the 89 respondents who reported a problem, 83 percent were unable to use the system or used the system with impaired functionality, ten points higher than the average.

Microscience says that while the 5.25-inch disks are an established product line and have few problems, the newness of the 3.5-inch disks and controllers has caused some technical problems. "The AT interface where the controller is part of the disk works well with some computers and not others," a Microscience representative explains. "But the largest contributing factor to technical problems relating to 3.5-inch disks is the newness of the interface and lack of familiarity of the people using it." Microscience works closely with controller companies to solve incompatibility problems between disks and controllers.

Microscience International

by Carol Levin

COMPANY SCORES



305 N. Mathilda Ave.
Sunnyvale, CA 94086
(408) 730-5965

▼ — Actual score ▲ — Average score □ — High-low range



The computer inside.

Since buying a computer today is such a numbers game, here's a simple rule of thumb. Look for 386™ SX, 386™ or 486™ on the outside to be certain that you have Intel technology on the inside. From the company that invented the microprocessor. The company that has shipped over 10 million 32-bit processors. The same company that's investing over \$1 billion this year

to make sure the computer inside your computer has the technology, power and compatibility to take you into the future.

intel®

The Computer Inside.

TECHNICAL SUPPORT

"From a marketing standpoint, customer service is becoming more competitive," says Terence Oliva, a marketing professor at the Wharton School of Business and former Microscience user. "Once people are willing to open their machines and become more knowledgeable about their boards and switches, they think more on the service side. People moving on to second machines are not asking just for more power for the buck. Reliability becomes more important, and so does service. The result is dealers moving into

Microscience International

Model HH-1060



nonprice competition."

Microscience's technical support is more accessible now than five years ago when Oliva's 40MB hard disk was acting flaky after less than a year of use. "The problem was that I just couldn't get a hold of anyone. I tried my retailer for a telephone number, but people didn't know where they were. I called someone in Washington state, but he did service only on some Microscience hard disks. I basically blew it off. It's now sitting in a box," Oliva says.

As an original equipment manufacturer selling primarily to distributors and the OEM market, Microscience rates well for technical support, receiving the highest possible ratings from 10 percent more users than the average. Respondents rate overall technical support a 74, that's five points higher than the average. There is a technical support line and four technicians at the San Jose, California, headquarters who respond to field calls from any Microscience hard disk user, but the company does try to divert users back to the dealer.

Earlier this year Microscience relocated its corporate facility and admits to having had a few weeks of telephone trouble. "There was a transition period that we've greatly improved upon," says a representative. The company expects to offer an 800 number and a bulletin board service soon.

HARD DISKS

REPAIR

On the repair front, Microscience also rates higher than average, scoring 83, compared to the average rating of 75. While disks are under warranty, repairs are made at Microscience's three locations—San Jose, California, Singapore, and Taiwan—otherwise, only authorized service outlets do repairs.

The challenge is to keep people like Wesley Knapp, small computer systems manager at McConnell AFB in Kansas, from losing confidence. For him service isn't the problem; it's reliability. An identical noise problem sabotaged three of his Microscience HH-1050s. An outside contractor repaired the disks and brought Knapp new ones, but the last replacement wasn't from Microscience. "People like to depend on their hard disks, and we can't," Knapp says.

THE PAYOFF: CUSTOMER LOYALTY

For the most part, current users trust Microscience for their future hard disk purchases. In fact, scores on this front practically match the average of 81 percent among all manufacturers.

For Charles Parcells, a sales representative in Grosse Pointe, Michigan, all of his computer equipment—including a HH-1060—has been functional, reliable, and a good value for the dollars invested. "Measuring the performance of equipment is swell, but when you put down two to five grand for a PC, you want to know how reliable the performance is and for how many years you will get it. A PC is the most expensive item most people buy after a house and a car."

Nine months was the average reported length of usage of all Microscience models, which is quite young compared to the 18-month average among all manufacturers. But even the veteran disks continue to provide reliable service. For three years, Fred Hoffman of Vacaville, California, has had reliable performance from his Microscience HH-1050 installed on a 286 clone. "Microscience is bulletproof. My disk was shipped to and from Hawaii, northern and southern California, and didn't drop a bit, sector, or cluster!"

HH-1060

Out of 11 models, the half-height 1060, a 65MB RLL (run length limited) version of the company's flagship product, received enough responses to be rated inde-

pendently. While Microscience's 5.25-inch disks have given 17 percent of the respondents a problem, the HH-1060 does a little better, troubling 15 percent of its users.

Richard Ziegler of Orlando, Florida, ran into trouble when he tried to format a second HH-1060 that he added to his 386. "The exact cause of the malfunction isn't certain. However, excellent cooperation of technical support operations from both Northgate and Rose Hill Systems solved the problem. Both the hard disk and controller were replaced—and there have been no failures of any kind in the last ten months of continuous usage," says Ziegler.

86 percent of HH-1060 respondents indicate that they would buy from Microscience again, compared with the overall average for all hard disks of 81 percent.

CIRCLE 422 ON READER SERVICE CARD

MiniScribe Corp.

by Donald P. Willmott

COMPANY SCORES



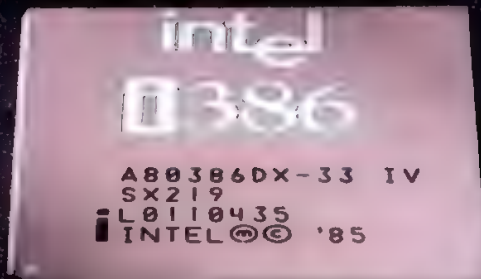
For information on
Miniscribe hard disks
call Maxtor Corp.
(408) 432-4482

Legend: Actual score (blue), Average score (red), High-low range (grey)

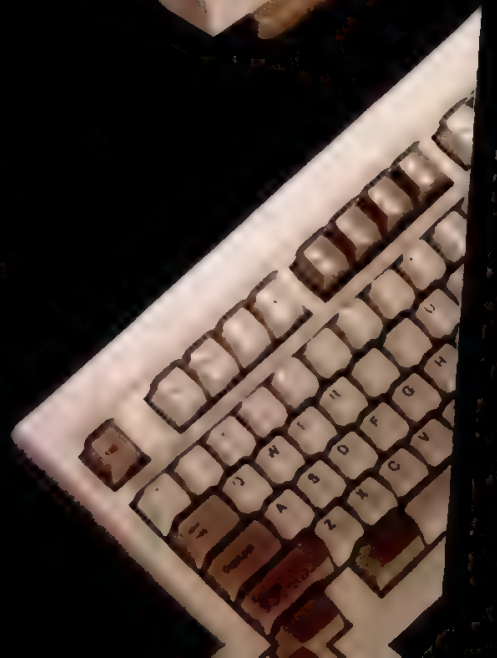
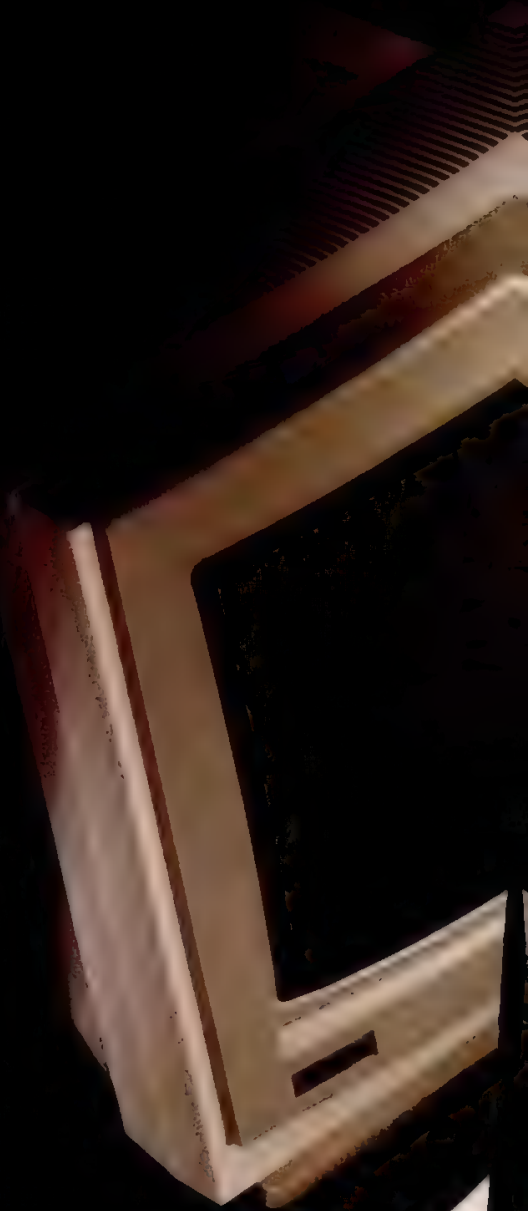
While it's possible to discuss the reliability of MiniScribe's hard disks (as plenty of survey respondents have), it's not possible to discuss MiniScribe's current technical support and repair practices because the company no longer exists.

In April, Maxtor Corp. (see the Maxtor Corp. review) acquired MiniScribe's assets in bankruptcy court. Maxtor has formed a subsidiary from MiniScribe's assets and is calling it Maxtor Colorado Corp. The new arrangement went into effect on June 30, and out of this change will come hard disk products under the Maxtor Colorado name.

All the MiniScribe hard disk models for which there are a statistically reliable number of survey responses have reliability ratings slightly lower than the average



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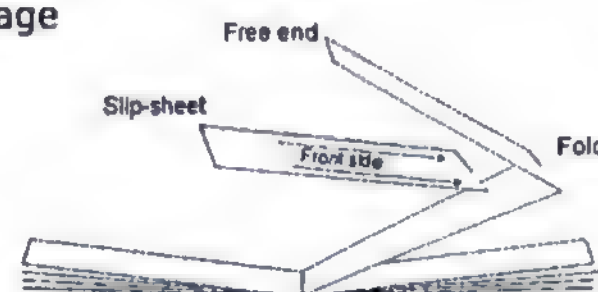
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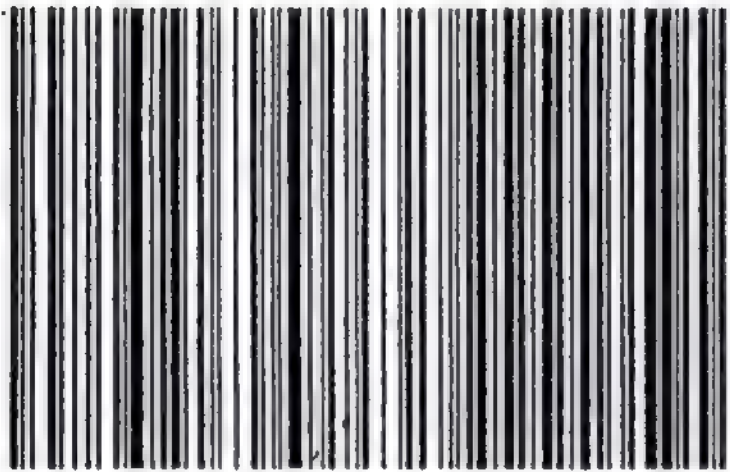
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Reason #3

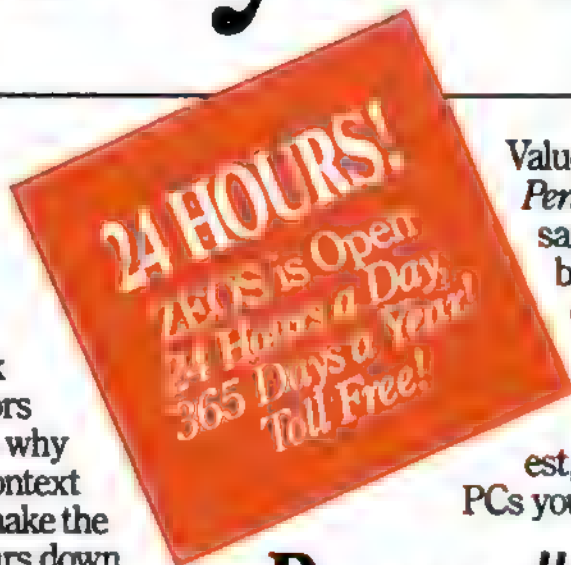
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Value: Excellent." *Personal Computing* said, "ZEOS... is the best value we've come across... its performance is right up there with the slickest, most expensive PCs you can buy."

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HARD DISKS

for all hard disks. Nevertheless, MiniScribe disks have been popular. The company was the second most-often mentioned disk manufacturer in the survey, yielding 1,572 responses.

25 percent of MiniScribe respondents, an average number, reported a problem with their hard disk. Of those people reporting trouble, 76 percent said their disk had been impaired or unusable in the past year. Respondents have been using their MiniScribe disks for an average of 18 months.

3085

38 percent of respondents who use the 71MB MiniScribe 3085 have had a problem with it at one time or another. That's 17 percent above the average for all hard disks and the highest of any model in the survey. 86 percent of those problems have occurred in the last year, and they have been frequent: the average number of occasions that the disk was impaired or unusable was eight, which is twice the average for all hard disks.

The numbers show, and users' comments confirm, that formatting the disk correctly is a particular problem for this model. Dick Dickstein, president of the Las Vegas PC User's Group, received a defective 3085 that wouldn't format with OnTrack System's *Disk Manager*. He eventually got satisfactory service through his dealer, and the replacement disk has been operating well for six months.

An unusually high number of respondents point out that the 3085 is noisy. One respondent says that his 3085 started squeaking after six months of use. "It's very noisy when reading and writing and gets louder and louder." The retailer, PC Warehouse, suggested trading it in or sending it back to MiniScribe, but wouldn't

gizer pink rabbit. It keeps going and going and going."

3650

The 42MB 3650, which has an average access time of 61 milliseconds, gets an overall reliability rating of 85, only slightly below the average for all hard disks. It has the lowest incidence of problems, 26 percent, of all the MiniScribe disks analyzed here. Those problems, however, appear more severe than those suffered by other MiniScribe disks, with a severity rating of 74 against a 66 average for all MiniScribe disks.

Edward Eby, a value-added reseller from Reynoldsburg, Ohio, says, "This 3650 is my fourth. The first, which I ordered from CompuAdd, failed after 15 minutes, and CompuAdd replaced it. The second one failed in the 13th month of my one-year warranty. CompuAdd was not sympathetic even though I had used the disk for only 10 percent of its 15,000-hour MTBF. MiniScribe air-freighted me two more disks; the people were kind and courteous, but I won't ever use their equipment again."

Avanish Zaveri of Los Angeles had a more positive experience when his disk crashed. "I was given the toll-free number of MiniScribe's repair facility in San Francisco," he says. "The man I talked to was extremely helpful, and rather than force me to send in the disk for repair, he talked me through the process, thereby saving me two weeks of downtime."

Like the 3085, the 3650 seems to suffer occasionally from boot-up or formatting problems. David Gertler, an assistant editor at Seybold Publications in Media, Pennsylvania, used *Disk Technician Ad-*

"Rather than forcing me to send in the disk for repair, MiniScribe talked me through the process, saving me two weeks of downtime."

guarantee when or if he would get it back. "The data integrity is OK," he says. "There's no fragmentation, it's just loud as hell. I'll keep using it until it drops and just keep backing up and wearing ear plugs."

But on the other hand, Bill Fogarty, a banking auditor from Vancouver, Washington, says his 3085 is "like the Ener-

vanced, which he highly recommends, to fix his 3650's boot problems.

Overall satisfaction with technical support and repair for the 3650 is average, as is the 77 percent of respondents who would buy from Miniscribe again.

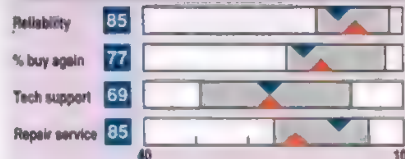
Richard Gach of Bloomfield, Michigan, is not one of those people. "I was very disappointed that neither the dealer

MiniScribe Corp.

Model 3085



Model 3650



Model 8450



Legend: Actual score (blue triangle), Average score (orange triangle), High-low range (gray bar)

nor the manufacturer of my disk was able to help when it failed after 14 months of relatively light use—two months out of warranty." Repairs at a local shop cost him \$125.

But Alan Rognlie, a programmer from Racine, Wisconsin, says "I low-level reformat the 3650 about once a year, and that seems to keep it happy."

8450

The 42MB, 45-millisecond 8450 gets the lowest overall reliability rating of all the hard disk models we analyze here. 33 percent of respondents report a problem with the disk, which is most disturbing since the average age of the disks is just eight months. Luckily, users say that the problems they suffer are less severe than average; many relate to installation.

The 8450 also suffers from the worst rating of all hard disks for technical support: 53 on a scale of 100. Of the respondents who told us where they went for technical support, an above average number say they turned to the direct marketer from whom they bought the disk. Their satisfaction rates at 50, a full 20 points below the average rating of 70 for all hard disks.

Conversely, repair service rates above average. Dale Young, a PC consultant from Duncansville, Pennsylvania, says "I got my 8450 through Hard Drives International. They are a great bunch of

HARD DISKS

people and the warranty is longer than the one offered by the manufacturer."

However, another survey respondent, Richard Tolman, a zoology professor at Brigham Young University in Provo, Utah, reported trouble with Hard Drives International. He returned a defective 8450 to HDI and waited a month for a replacement. "Within two weeks," he says, "one original bad sector had deteriorated into 1.6MB of bad sectors." When Tolman returned that disk to HDI and ordered a Seagate ST251-1 instead, it was slow to arrive so he cancelled his order and went to a local dealer to buy his new disk.

CIRCLE 423 ON READER SERVICE CARD

Mitsubishi Inc.

by Alan Cohen

COMPANY SCORES



991 Knox St.
Torrance, CA 90502
(213) 515-3993

—Actual score —Average score —High-low range

It's the sort of thing that would never happen on "60 Minutes"—we went out looking for dirt, and came up completely empty. Judging from the results of our survey, the 83 Mitsubishi hard disk owners who answered our questionnaire seem to have two distinct things in common: a distaste for any kind of controversy and completely functional hard disks. A technically savvy bunch, these users are overwhelmingly satisfied with their choice in mass storage.

While known primarily for its popular line of monitors and laptops, Mitsubishi manufactures a complete array of hard disks, including both 3.5- and 5.25-inch models. All units come with a 12-month warranty covering parts and labor. If your hard disk fails, you simply send it back to the factory (at your own expense) and Mitsubishi will make the necessary repairs and return it via UPS ground (at their expense). Overnight shipping is available, but if you want it, you've got to pay the extra charge for it. The company claims a turnaround time of ten business days.

TOLL-FREE HOTLINE

A toll-free technical support hotline is also available. This service is unlimited and free. In fact, confirming this, a Mitsubishi spokesperson expressed genuine shock that some companies actually charge for their telephone support.

In our survey, Mitsubishi respondents give their disks an average reliability rating of 92. While this is statistically indistinguishable from the overall score of 89 in this product category, it should be noted that just 12 percent of the Mitsubishi owners who responded report *ever* having a hardware, service, or repair-related problem with their unit. Of all hard disk manufacturers, only Hewlett-Packard matches this number. Moreover, of the five Mitsubishi owners who *do* report a problem, four still give the disk a reliability rating of 75 or higher. Neil Harrington, a student from Middletown, Connecticut, who believes his problems with Mitsubishi's MR535 disk were due to power supply problems with his CPU says, "It's just a beautiful hard disk. Very quiet, very fast."

One reason so few Mitsubishi owners report problems may be that most of those who responded have not owned their unit for very long. In fact, 74 percent say they have owned their hard disk for one year or less. For the product category as a whole, this number is 43 percent.

However, it's clear that it is the long-term Mitsubishi owners who express the greatest satisfaction with the product. Kevin Daniel, a technical support specialist in Bend, Oregon, has had his disk for three years. According to Daniel, "I've never had to deal with their technical support because I haven't had any problems. It's the quietest hard disk I've ever used." Thomas F. Bailey, a systems engineer in Eugene, Oregon, has had his Mitsubishi disk for over two years and says, "It's a good AT disk. I was pleased with Mitsubishi's Diamond Scan monitor, so I bought its hard disk as well. It's a solidly-built unit. I highly recommend it." While Bailey has had a couple of minor problems with his unit, he's found the company's technical support staff to be knowledgeable and helpful. "It takes a while to get through sometimes," he says, "but once you do, they have the answers right away."

Surprisingly, given Mitsubishi's readily available, free, phone support, only 26

percent of the Mitsubishi owners who answered our questionnaire are aware that there even *is* a hotline. Furthermore, a full 40 percent believe no phone line exists, period. While those who have used the hotline are generally satisfied with the support they receive (the Mitsubishi hotline rates 75, equal to the overall score for this category), there seems to be a certain lack of communication between Mitsub-

Mitsubishi Inc.

Model MR535



—Actual score —Average score —High-low range

ishi and the end-user regarding the support system. Indeed, when *PC Magazine* contacted Mitsubishi to inquire about the company's electronic bulletin board system, we spoke to five employees before finding one who actually knew there was a BBS in existence.

MITSUBISHI MR535

By far the most popular of the Mitsubishi hard disks is the MR535. This unit, which has an average seek time of 28 milliseconds, is the disk the majority of respondents say they own and it was hard to find one person with a negative comment about the disk.

There's good reason for that. Just 7 percent of the owners who responded claim to have ever had a hardware, service, or repair-related problem with the disk. And even the three who did regard the unit highly.

Welbrey A. Hill of Tallahassee, Fla., calls the unit "rock solid, a jewel—the best 65MB your money can buy." Ray Sroberts, a CAD system manager in Redmond, Washington, agrees: "It's fast and quiet. I'm looking to put in a second one." Frank J. Goddard, an engineer in Santa Barbara, California, says that the company's devotion to quality and technical support is what impressed him most. "It shows throughout the line that I bought from them, and I've never had a problem. Mitsubishi should be the standard in regards to technical support."

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CIRCLE 281 ON READER SERVICE CARD





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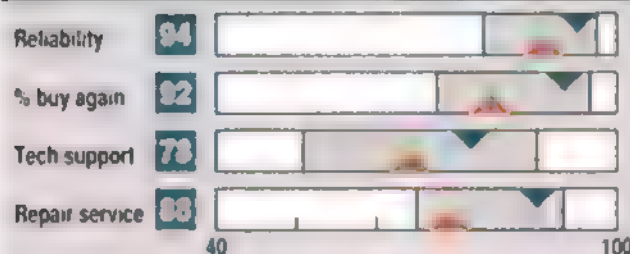
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*To learn what business professionals and MIS managers had to say about Macintosh versus MS-DOS or Windows, call for a free booklet summarizing the new study by Diagnostic Research, Inc. The number is 1-800-446-3000, ext. #60.
CIRCLE 251 ON READER SERVICE CARD

Plus Development Corp.

by Rink Murray

COMPANY SCORES



1778 McCarthy Blvd.
Milpitas, CA 95035
(408) 434-6900
(800) 624-5545 (sales)

Plus Development Corp. does its job right. By making reliable hard disks, then backing them up with superior technical support and repair, it has developed a loyal following. At least that's what the respondents tell us. Of the 324 respondents who use Plus hard disks, 92 percent say they would buy from Plus again—a percentage unequalled by any other hard disk manufacturer.

According to the respondents, Plus is also the overall winner in terms of satisfaction with the manufacturer's hard disk repair service (rating an 86), and with a score of 94, the company ties Toshiba America for the highest average reliability rating. But this level of overall satisfaction is not the only thing that makes Plus stand out.

For years, Plus has had a slightly different approach to mass storage. The company asked the question, "If you're going to occupy a full-length slot with a hard disk controller, why not just put the disk on the card, too?" So, that's what they did.

The advantages of keeping your hard disk on a card are abundant. If you ever need to quickly transport your programs and data from one place to another, you can just pop the card out of the machine and take it with you. Hard cards are also an efficient way to upgrade your machine's storage capacity without disturbing the existing disks.

Respondents indicate that Plus provides much of the technical support for its users. 23 percent of the Plus respondents say that the manufacturer provided the support. And those people rate the manufacturer as above average (83) for overall satisfaction with technical support, 13

SERVICE AND RELIABILITY

HARD DISKS

points above the average.

Of all the people who used Plus's technical support, 84 percent were very satisfied with the help they received, 18 percent above the average. This level of satisfaction is remarkable considering the average hard card has been in use for 25 months, seven months longer than the average for all hard disks.

Plus does slightly below average where 25 percent of the respondents say they have had a problem with their disk. 48 percent of those people classify the problem as "most serious;" this hovers around the average.

SERVICE SATISFACTION

Hard card users who responded to the survey gave Plus a rating of 86 for satisfaction with repair service; the overall average was 67. Most interesting, however, are the comments made regarding Plus's service. Now and then there were complaints about incompatibilities and not-so-helpful support, but the more comments we read, the more impressive they became.

Bill Aumen, a programmer from Point Roberts, Washington, tells the following story: "Their local warranty rep, CompuServe, was useless. After doing standard diagnostics they assured me there

expired. Now that's what I call service! I would unequivocally recommend choosing Plus hard cards."

To what extremes has Plus gone in order to satisfy its customers? Frank Bates of Washington, D.C., tells his story: "Plus replaced my unit promptly and at no charge, even though it was no longer under warranty. That's especially noteworthy since my system and I were in Turkey at the time. Excellent support!"

Such active support is unusual. We asked a Plus technical support manager was if it is an unwritten policy to replace any hard disks even if they are out of warranty, and she says no. However, she adds, "Plus' service is evaluated on a case by case basis, so not everybody who has a problem will get a new disk for free, but it does happen."

In the past, Hardcard 20s and Hardcard 40s have demonstrated incompatibility with 386 machines. More specifically, some people have complained about incompatibility with *Microsoft Windows/386*. Plus says this problem is resolved in the Hardcard II series, 16-bit cards that have no problems with 286 or 386 machines.

Plus has ten technical support representatives to handle the company's 900 number. The charge per call is \$5. When asked why they had chosen a 900 number over a toll-free number, Plus representa-

"Plus Development replaced my unit promptly and at no charge, even though it was no longer under warranty. That's especially noteworthy since my system and I were in Turkey at the time."

was no problem and refused my offer to demonstrate the problem to them. So I called Plus Development—after two "can't do anything" responses and two more unanswered calls, the fifth call reached a guy who immediately recognized the symptoms and told me to return the disk. They gave me a new unit with a two-year warranty from the replacement date. (The original one-year warranty was 11 months old already.) A rocky road, but a terrific ending!"

Robert Herold, a programmer from New Hyde Park, New York, says, "They sent me a replacement unit free of charge, even though the warranty on mine had

tives said they could provide better and faster technical support. A spokesperson for the company says, "When we had an 800 number most of the calls were DOS questions or questions that were clearly answered in the manual. Now with the 900 number, most of the calls concern real troubleshooting. Also with the 900 number we're able to provide much faster service; we can usually answer a call within the minute."

Since the Hardcard 20 and the Hardcard 40 are the two oldest Plus products, they are the ones our respondents use the most. However, they do not represent the entire Plus product line. In addition to

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CIRCLE 241 ON READER SERVICE CARD

these disks, Plus offers the faster Hardcard II series in either 40MB or 80MB sizes.

HARDCARD 20

Plus first introduced the Hardcard 20 in 1985—it was the first hard disk on an expansion card that occupied only one slot. In the early stages, some of the Hardcard 20s were said to have “lazy motors,” meaning that when you turned on your PC you couldn’t always rely on your Hardcard to start spinning unless you literally nudged it along.

However, with an average reliability rating of 97 (8 points above the average) our respondents indicate that the Hardcard 20s have been incredibly reliable. What is most remarkable about that statistic is that the average Hardcard 20 respondent has been using his or her disk for 31 months (13 months longer than the average). 31 percent of Hardcard 20 users have been using the disk for over three years, four times the average.

26 percent of the respondents say their

Plus Development Corp.

Hardcard 20



Hardcard 40



disks worked properly all the time during the past 12 months. Compared to the 5 percent who say their disks worked properly during that time our respondents indicate that even though Hardcard 20s are used longer, they are five times more reliable than the average hard disk.

And when something did go wrong, Plus was there to help. Hardcard 20 respondents who used the technical support hotline give Plus a technical support satisfaction rating of 88, which is 18 points higher than the average.

With so many satisfied customers it is little wonder that 89 percent of the Hardcard 20 users say that they would buy

SERVICE AND RELIABILITY

HARD DISKS

from Plus again (8 percent above the average). Surprisingly, Hardcard 20 users estimate that their disks will last them another 36 months, four months longer than Hardcard 40 users, and seven months longer than the average.

HARDCARD 40

Survey respondents who use Plus Hardcard 40s are devoted to Plus Development. 96 percent say that they would buy from Plus again.

Hardcard 40 respondents say their disks are dependable, by rating the card’s reliability as 91. 28 percent also say that they’ve had a hardware, service, or repair problem. Of that 28 percent, 78 percent say that the specific problem impaired or rendered their Hardcard 40 useless.

So, given that the Hardcard 40’s reliability ratings are pretty average when compared with all other hard disks, what makes Hardcard 40 users so much more loyal to Plus? Perhaps the answer lies in the two important areas where the Hardcard 40 respondents think Plus excels.

First, respondents give Plus an average satisfaction rating of 79 (nine points above average) for Hardcard 40 technical support. Second, the company receives an 85 for its repair service—a whopping 18 points better than the average.

82 percent of the Hardcard 40 respondents say they are “very satisfied” with Plus’s technical support—the average for all companies is 66 percent. At the other end of the spectrum, only 7 percent say that they were “not at all satisfied,” while the average for all companies is 14 percent. In terms of satisfaction with the manufacturer’s repairs, 80 percent say they’re “very satisfied.” Again Plus beats out the overall average of 63 percent.

Up 9 percent from the overall average, 92 percent of respondents say that the Hardcard 40 has lived up to their original expectations for it, and they indicate that the disks will continue to meet their needs for another 32 months.

With these numbers, Plus Development demonstrates that even if a product is not able to out-perform the competition, the ability to provide good technical support and maintain effective service and repair facilities are still a big advantage, and will continue to keep customers coming back.

CIRCLE 425 ON READER SERVICE CARD

Priam Systems Corp.

by Rink Murray

COMPANY SCORES



1140 Ringwood Ct.
San Jose, CA 95131
(408) 954-8680

Actual score Average score High-low range

Let’s just skip over the beginning of this story and go straight to Chapter 11 where, just a few months ago, the founders of Priam Corp. began the process of sorting through the company’s assets. For several months Priam had been beleaguered with financial difficulty, and as the company careened toward bankruptcy it virtually abandoned all of its service and technical support.

At least that’s how Dick Reiser, vice president of marketing for Priam, accounts for the poor service rating our respondents give the company. Of the Priam respondents, only 73 percent say that they would buy from the company again (8 percent below the overall average). This said, there are a few misconceptions about Priam to correct.

First, the current Priam Systems Corp. has no relationship to the bankrupt Priam Corp., the company our respondents rated so poorly. When the original Priam Corp. went bankrupt, the current company purchased the rights to the Priam name and continued to sell the company’s after-market disk storage products. Two other companies, Atasi and Sequel, purchased the manufacturing portion of the old Priam Corp. and continue to sell their products to the new Priam Systems Corp.

AVERAGE RELIABILITY

Our survey indicates that Priam hard disks are just as reliable as the other hard disks. 23 percent of our Priam respondents say that they encountered a hardware, service, or repair-related problem. This number is only 2 percent above the average, yet the average Priam user has been using their disk for 22 months—four months longer than the average respondent. So while Priam disks may score a bit worse in this category, the disks have had more wear.

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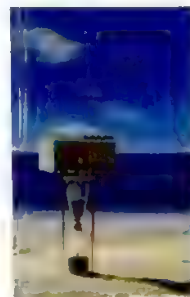


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CIRCLE 297 ON READER SERVICE CARD

HARD DISKS

Seagate Technology

by Donald P. Willmott

COMPANY SCORES



920 Disc Dr.
 Scotts Valley, CA 95066
 (408) 438-6550
 (800) 468-3472 (sales and technical support)

—Actual score —Average score —High-low range

In the crowded hard disk market, California-based Seagate Technology, a multi-billion dollar hard disk behemoth, leads the pack by a comfortable margin. Of the 16,285 respondents who described their hard disks for our survey, 7,155 said they use a Seagate model. Because of the high number of Seagate respondents, the company's scores across all the survey questions fall well within the averages for all hard disks. Seagate disks get an overall reliability rating of 88, and 23 percent of the respondents report having a problem with their Seagate disks, which is right on average. Satisfaction with technical support and repair rate at 70 and 77 respectively, also at the average.

Seagate users are more likely to seek support through direct marketers than

then pass them along to VARs, consultants, and retailers, there are no authorized dealers. Seagate does, however, run a large semi-annual educational series throughout the U.S., Canada, and Mexico that provides sales, product, and technology training to anyone who sells Seagate products.

FREE TECHNICAL SUPPORT

Seagate also provides a toll-free technical support line, which is active 11 hours a day (and staffed by 22 people), and the company sponsors a bulletin board service that can be reached at (408) 438-8771. The standard warranty for Seagate products is one year, though people who buy through mail order may find that the intense competition in that arena forces some vendors to extend warranties in order to attract business. On-site service contracts are also available.

To maintain close ties with its biggest customers, each OEM client and large corporate account has a team of Seagate representatives assigned to it. The team includes people from both the engineering and sales sides, so the client always knows who to call to get quick results.

Distributors enjoy the same arrangement. Each one is assigned a team that includes field support engineers, in-house engineers and account coordinators. Seagate also tries to help distributors maintain good relationships with dealers. In order for a distributor to remain authorized, it must pass along the warranty Seagate gives to the distributor.

The standard warranty for Seagate products is one year, though people who buy through mail order may find that the intense competition in that arena forces some vendors to extend warranties in order to attract business.

users of other hard disks. That's because so many Seagate disks are bought by individuals through mail order firms and VARs. MIS managers will be happy to know that business users of Seagate hard disks who have in-house support centers rate the service they provide highly.

Those people who have repair work done by Seagate send their disks to service centers in Del Ray Beach, Florida, Oklahoma City, or Singapore. Since Seagate sells its disks to distributors who

As you read of some users' experiences with Seagate hard disks, you'll come across several stories about Seagate disks freezing on power-up (a phenomenon sometimes called stiction, pronounced "STICK-shin"). Of course, the large numbers of respondents who discussed Seagate made it more likely that problems like this would appear in the survey, and indeed, every drive manufacturer faces this type of problem. Nevertheless, Seagate was willing to go through its

Respondents also give Priam disks an overall reliability rating of 88, which is barely below the overall average of 89. And 87 percent of the respondents say that Priam disks have lived up to their initial expectations, 4 percent better than the average.

Given these facts, which indicate that Priam's hard disks are indeed as reliable as most other company's, then what brings Priam's "buy again" numbers down? William Easterday, of Elyria, Ohio, sums it up pretty well: "The problem we had was not with the disk itself. Priam's tech support was terrible."

Up 8 percent from the average, 17 percent of the Priam respondents say they called the manufacturer for support. But these greater numbers are not a measure of popularity. For overall technical support satisfaction, respondents rated Priam a 59, a full 11 points below the average.

The old Priam Corp. quit servicing last November, so when the new company formed there was already a backlog of unrepaired disks and unanswered questions.

"By now things are pretty much up to speed," says CEO Wil Cochran. Currently, Priam Systems Corp. employs four full-time technical support representatives to run the technical support hotline. There is also a proprietary bulletin board service available.

A company spokesperson told us that Priam Systems Corp. had no immediate plans to start manufacturing its own hard disks. Instead, the company will continue to OEM from other manufacturers, and it will use these disks as a foundation so they can focus on software development. In an effort to increase buyer satisfaction, Priam will develop software to enhance hard disk performance, then ship disks with its software installed under the Priam label.

Priam disks ship with self-installing software, and included with each hard disk is a manual designed to guide users through any difficulties as well as to serve as a secondary DOS manual. "Our goal," says Cochran, "is to make it safe, make it easy, and make it friendly."

And Priam has continued to remain friendly with its large quantity buyers. Priam recently announced that it has retained virtually all of its previous customers. It will be interesting to see how Priam fares the next time this survey comes around. The company's current rankings can only improve.

CIRCLE 426 ON READER SERVICE CARD

HARD DISKS

technical support data to see if there was an abnormally high number of disk freezing/stiction problems being reported, and it came up with nothing unusual.

According to Seagate, hard disk users should never "mess around" with their hard disks, manipulate them by hand, or open it up, as a number of survey respondents reported they had. "For one thing," says a Seagate representative, "it voids the warranty. That's why we have the toll-free hotline for end users. People don't even have to have a Seagate drive to call. If we can't solve the problem, we'll tell the user how to get the drive repaired."

The Seagate representative also says that 80 to 90 percent of technical support phone calls relate to installation, formatting, and software—not disk malfunctions. The rest of the calls cover a broad cross section of questions regarding controller, system, and disk problems.

WOULD YOU BUY AGAIN?

Despite a number of individual horror stories, some of which are detailed below, the percentage of people who say they would buy from Seagate again is the same as (or slightly higher for some individual disk models) the average percentage of people who told us they would buy from the same manufacturer again.

Seagate shouldn't be surprised by that statistic, given the trouble they take to make themselves accessible to end users. However, according to a Seagate representative, "People think that big companies can't maintain a personal relationship with their clients, but at the same time, small companies don't have the money to build the kind of support networks people need. Seagate tries to deliver the best of both worlds."

Detailed survey results for eight popular Seagate models appear below. All the models, with the exception of the ST4038, are still in production.

ST4038

Respondents who comment on the 30MB, 40-millisecond ST4038 (no longer in production) have a lot to say about reliability because 37 percent of them have used their disk for more than three years, and the average age of the disks is 34 months. Although the machine's overall reliability is average, ST4038s have had a much lower than average problem incidence in the past year. Users have apparently gotten their disks configured the best possible way by now.

Nevertheless, problems suffered by ST4038s are more severe than those of other Seagate disks, according to survey respondents. Vince Vielhaber, a programmer at Chrysler Corp. in Highland Park, Michigan, says his ST4038 has had disk freezing problems, just as many of the other Seagate disks in his organization have had. "I have seen seven of these in the past four months, and Seagate admits nothing. They blamed the user's power supply," he says, "but I had the means to check that, and my power supply was fine."

George Holmack, a consultant from El Paso, has no complaints with Seagate, but plenty of complaints with the local dealer who set up the disk incorrectly, and later refused to do anything to rectify the situation. "Western Digital (the manufacturer of Holmack's controller card) was impressive in helping me get my disk to work with my controller, but the salespeople at the dealer were totally incompetent," he says.

ST296N

The 84MB 28-millisecond ST296N, which has a SCSI interface, has the highest overall incidence of problems of all Seagate disks: 30 percent, nine points over the average for all hard disks and seven points over the average for all Seagate disks. Given that the average age of the disks is a short seven months, a lot of people have had a lot of problems soon after starting to use the disk.

The ST296N also gets the lowest ratings for technical support and repair of all Seagate disks, whether the service was provided by Seagate or by any other source.

Quoc-Anh Arcomena of Centreville, V.I., bought an ST296N because of a great price, even though he had heard of problems. "This product should be recalled," he says. "It is defective in design. My disk has failed three times."

Steve Dunne, president of Dunne Oil in Wichita, Kans., says, "My ST296N has been totally reliable but makes strange noises on occasion. It sounds like a jet taking off." Dunne also says that his *PC Tools Deluxe* defragmenter utility destroyed data on the disk, but Central Point Software was quick to send a fix, and he hasn't experienced problems with Version 6 of the software.

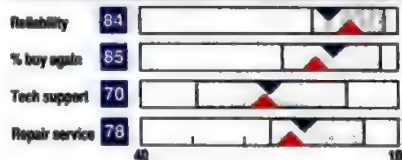
Mitch Comstock of Progressive Insur-

Seagate Technology

Model ST296N



Model ST4096



Model ST277



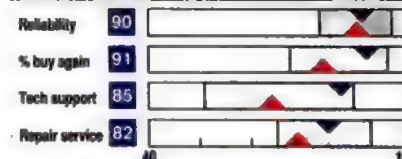
Model ST251



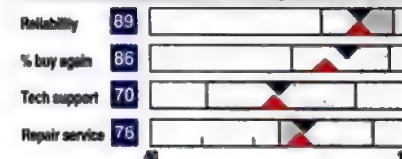
Model ST238



Model ST138



Model ST225



Legend: ■ Actual score ▲ Average score □ High-low range

ance in Seattle, Washington, decries what he calls the ST296N's "retro engineering." And yet, of the 103 people who told us about their ST296Ns, 84 percent said they would not hesitate to buy from Seagate again.

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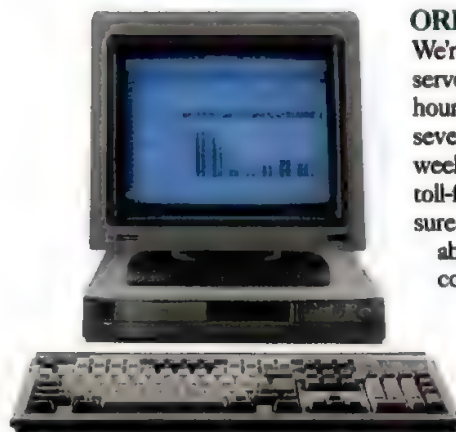
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HARD DISKS

ST4096

The 80MB, 28-millisecond ST4096 gets the lowest overall reliability rating of Seagate disks, but that rating, 84, is at the average for all hard disks. 27 percent of users who responded report a problem with their disk, and 85 percent of those people say that their disk was impaired or unusable during the past year, slightly worse than average.

“For several months I thought I had formatted the disk incorrectly, but I finally figured out it wasn’t me. Though I never lost any data, the disk was moody. It would access one day, but not another.”

Richard Williams of Oxford, Massachusetts, says, “The failure of my ST4096 after four months of operation has me worried about the reliability.”

David Wilson of New York City tells this story: “My ST4096 came as part of a 386 system I ordered from CompuAdd. For several months I thought I had formatted the disk incorrectly, but I finally figured out the problem wasn’t me. Though I never lost any data, the disk was moody. It would access one day, but not another. CompuAdd technical support was fast. They sent a new disk immediately, talked me through the installation, and it has run fine for nine months. I never even considered calling Seagate, because the CompuAdd warranty was still active.”

Steven R. Roth reports trouble with Express Micro Mart, the mail-order firm he used. “First they didn’t acknowledge the problem, then they sent me back the same defective disk I had sent them. Then they took six weeks to get a replacement from Seagate. I had to pay shipping to them three times for one claim!”

ST277

The 65MB ST277 comes as an RLL disk (model R) or a SCSI disk (model N). No other Seagate disk was more likely to have experienced a problem over the past year, but since the average user has only had his or her ST277 for 10 months, this statistic is somewhat skewed.

At least four ST277 users, including Greg Fontaine, a CAD specialist from Winston-Salem, North Carolina, David Tucker, owner of BearWare Information Services in Sarasota, Florida, and Paul

Cilwa, a software developer from Sterling, Virginia, found that their ST277s would stop spinning if the disk cooled down or would not spin on power-up. Cilwa’s solution was to remove the disk from his PC and shake it. Fontaine opened up his disk and actually turned the platters by hand, although such potentially dan-

gerous solutions are recommended only for the stout of heart and/or fat of wallet.

ST251

The 40MB, 24-millisecond ST251 is one of Seagate’s most popular hard disks. In fact, 1,935 people who responded to the survey reported having an ST251 or ST251-1, far more mentions than any other hard disk model received. This popularity, however, does not appear to be based on any particular excellence in reliability, service, or support. With an average reliability rating of 87, the ST251 is right on average for all hard disks. The 23 percent of respondents who reported a problem with their hard disk is also right on average.

Of those people who report having a problem, 76 percent (again, an average number) say that their disk was impaired or unusable in the past year. Where did they go for help? Most turned to Seagate or the direct marketer from whom they bought the disk. Satisfaction with both technical support and repairs was no higher or lower than average in either case.

Dick Albert, facility manager of Century Design in Atlanta, Georgia, has strong feelings about Seagate and the ST251. He isn’t satisfied at all. “I’m doing everything I can to ensure that no Seagate disks are in any equipment I order,” he says. “I don’t mind the complete failure of the disk with only 30 to 40 hours use as much as I do the complete indifference of the manufacturer to my inquiry on possible causes and corrective action.”

As previously reported, some users discussed disk freeze-up problems. Mark

Schneider of Gainesville, Florida, says, “The ST251 wouldn’t spin when the computer was powered up. It would stick. By giving the shaft on the underside of the disk a little push it would begin spinning. After contacting Seagate and performing the analysis suggested by them, the power supply was implicated, but by adding a drop of oil to the shaft I have not had the problem again.”

Robert Moses of Aurora, Illinois, dealt with CompuAdd. “The repair of my ST251 was delayed by the replacement disk being shipped in worse shape than my original. The next day a new disk and controller were delivered.”

ST238R

The 33MB, 65-millisecond, RLL ST238R has an overall problem incidence of 29 percent, which is slightly higher than average. But the average reliability rating it received from users who responded is a near-average 85. As one of Seagate’s older models, the ST238 has seen a lot of action. Users have had their disks for an average of two years, which is six months longer than the average time in use of all hard disks in the survey, and the third longest of the eight Seagate models described here.

The only place where users seem to have been unusually dissatisfied with the ST238 is in Seagate’s support of the disk. Users rated satisfaction with repair services provided by Seagate at 54, the lowest for any Seagate disk and 13 points below the average rating of 67.

Frank Kehoe of Austin, Texas, is one of several users who says his ST238 got “flaky.” Kehoe adds, “I used *SpinRite* and cleared the problem up. Now I use *SpinRite* every three to five months.”

Gregg Jackson, a social scientist from Washington, D.C., and owner of an ST238R, comments, “My experience, both personally and as a consultant to organizations with several PCs, is that the hard disks malfunction more frequently than any other component, and these malfunctions create the greatest inconvenience.” Jackson points out that he had a difficult time reaching Seagate for technical support and eventually returned the disk to the retailer.

ST138

The 32MB ST138 comes as an RLL disk (model R) and as a SCSI disk (model N). It has the lowest incidence of problems—17 percent—as well as the highest

HARD DISKS

reliability rating (90) of all Seagate disks. Of those people who report a problem, 89 percent say that the disk was impaired or unusable in the past year, but like the ST277, the average age of ST138s in service is a young ten months. Therefore the higher-than-average recent problem incidence may be somewhat misleading. Respondents did, however, rate the severity of their problems at 84; 17 points above average, which is the highest problem severity rating of all hard disk models specified by the survey.

Curt Gomm, an accountant from Manassa, Colorado, and Gordon Lincoln of Meadville, Pennsylvania, are two more Seagate users who have encountered freeze-up problems. Gomm says, "The ST138R is quite fast, but because of the problem with the motor and/or platters getting stuck I'm worried about it happening again. But I don't worry about losing data because you can get the platters turning again by using a credit card."

Lincoln reports, "When my ST138 quit the support staff was abrupt and unhelpful at first. I got a call back and a rep told me 'off the record' to open the drive, gently rotate the main shaft, and try it. It worked, but it froze a week later." As previously reported, a Seagate representative said that such advice would never be given by technical support representatives since the warranty would be voided if the drive were opened.

Ken Kirkendall, owner of The Database Manager in Dayton, Ohio, says, "Two identical Zeos 286-12 systems both suffered three ST277 failures each. Out of about 15 tech support calls to Zeos, I could only leave my name and number every time. Response time of the return calls averaged about three hours."

Buddy Molpus, a police sergeant from Longview, Texas, has been through three ST138Rs but has no major complaint with Hard Drives International, where he bought them. "Tech and customer support at HDI have been helpful. Customer support is especially friendly. I can't get through to a tech support person at Seagate at all."

ST225

The 20MB, 65-millisecond ST225 is one of Seagate's oldest, slowest, and best-known models. It was discussed in the survey by 927 respondents; they rate the disk's reliability at 89, right on average.

In service for an average of 27 months, ST225s have done a lot of spinning, and

successfully too, according to our respondents. Problem incidence in the past year is below average, and the average severity of problems that occur is below average as well.

Nevertheless, it seems likely that all 927 ST225 respondents are on the market for a replacement disk. No one can get along with just 20MB of mass storage today, and most hard disk models are now far faster than 65 ms. 47 percent of ST225

distribution markets. The company's approach to end-user technical support works because dealers handle calls at the front end. In 1988 the Disk Products Division expanded its sales channels, and today, has a national and international network of distributors that support a complete line of disk products.

LEADING INDICATORS

Toshiba measures up on most indicators of service and reliability, but takes the lead in others. Notably, Toshiba shares

"The Toshiba MK134/RLL disk is fantastic. Very fast, very quiet, and not a lost byte to date. I love it."

respondents feel that the disk will continue to meet their needs for no longer than a year; that's 16 percent above average for all hard disks.

John Holbrook of Dayton, Ohio, was typical of many respondents when he called his ST225 "slow yet reliable."

Kevin Singleton of Newport, Rhode Island, compliments Seagate on its support, which he calls "prompt and efficient," although he doesn't forgive the company for the two ST225s that crashed before he received a third.

CIRCLE 427 ON READER SERVICE CARD

the standing of best in reliability with Plus Development, both scoring 94 compared with an average of 89. And the company ranks just behind Plus in user loyalty, with 87 percent of users who responded saying they'll buy again from Toshiba.

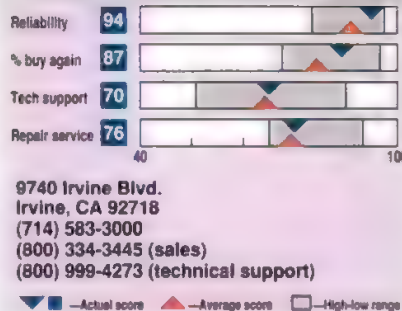
Also, Toshiba out-performed all other manufacturers on another measure of user satisfaction—whether or not their hard disk meets their needs. 89 percent of Toshiba users who responded said yes, compared with an average among all brands of 80 percent.

For Toshiba, the numbers speak for themselves, but so do some very satisfied and loyal customers. "The Toshiba MK134 RLL disk (a 65MB model) is fantastic. Very fast, very quiet, and not a lost byte to date. I love it," says Robert Wilson, manager of vehicle testing at Volkswagen Arizona Proving Grounds.

Toshiba America Inc.

by Carol Levin

COMPANY SCORES



"Our position is that a product lends itself to good support because it is reliable," says Phil Parise, vice president of operations at Toshiba. Survey respondents seem to agree. Toshiba America markets floppy disk drives, hard disks, and optical disks to the OEM, value-added reseller, and

SUPPORT AND SERVICE STATS

Not surprisingly, the 152 Toshiba users who responded report a significantly lower incidence of problems than users of other brands. The problems that do arise are the lowest in severity among all manufacturers, according to the survey. Respondents' satisfaction with repair service is about the average of 75. Ratings for technical support reflect the average of 69.

Gerald Burnette, a senior analyst at Environmental Consulting Engineers in Knoxville, bought two 386SX systems with Toshiba hard disks from PC Brand. He couldn't get the hard disk in one to format, even after several calls to PC Brand. "Finally, I read a technician the parameters listed in their manual. [He did

HARD DISKS

not get a Toshiba manual with the disk.] There was a typo regarding the number of cylinders on the disk. Setting this information correctly produced the desired results. I'm very happy with the performance of the Toshiba disk. I've changed versions of DOS and done all sorts of things and it works great," Burnette says.

FAX PREFERRED

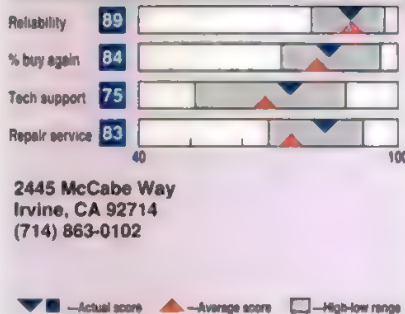
Although Toshiba likes dealers to handle technical support calls, both dealer and manufacturer phone numbers are included in the documentation. Toshiba prefers to receive all inquiries by fax if the user is able to clearly explain the problem, but the four phone support representatives dedicated to disk products will take calls from anyone with a Toshiba disk. The company monitors the types of calls handled by technical support and updates documentation to address the highest frequency calls. "Every two or three months we refine the documentation to eliminate calls and to bring dealers up to speed so they can provide support over the phone," explains Parise. Toshiba eliminated its bulletin board service because the company found that most calls require some kind of verbal exchange.

Because of the technical expertise and cost required to repair hard disks, Toshiba's Irvine headquarters services all disks in a clean room where disks are tested as if they were being remanufactured. "We take responsibility at the depot

Western Digital Corp.

by Rink Murray

COMPANY SCORES



In terms of reliability, Western Digital may seem rather... well... average. And with a score of 89 for overall reliability the company does indeed match the average exactly. But this does not mean that Western Digital is indifferent or ambivalent about service and support. The Western Digital respondents describe a company striving to keeping its customers satisfied.

Most respondents are satisfied with Western Digital. 84 percent say they would buy from the manufacturer again, which is 3 percent greater than the average.

"Most of the answers can be found in the manual," says Western Digital's tech support director, "but after we sell our disks to other companies, we're not always sure if the documentation reaches the end user."

in Irvine so no one is out there doing improper repair," Parise says. Turnaround time for repair is less than 30 days. Relatively more time is for the old 8-inch disks, relatively less for 60MB 3.5-inch disks.

David Johnson, an engineer in Needham, Massachusetts, has never needed Toshiba technical support or service. Perhaps that says it all, but he adds, "The Toshiba MK134 disk I opted for was worth every penny. This thing is fast and accurate. Not one problem."

CIRCLE 428 ON READER SERVICE CARD

Like most hard disk manufacturers, Western Digital sells its disks to companies who incorporate them into their computers—in turn, the third-party companies take over the support and service responsibilities.

Ralph E. Coleby of Brooklyn, New York, says, "On delivery the host adapters for the floppy and hard disks were not seated properly and the hard disk failed. [The third-party vendor's] technical support leaves something to be desired. I was put on hold for over an hour only to be told to leave a message. I wasn't contacted

until three days later. Western Digital responded immediately and referred me to a repair center."

18 percent of the Western Digital respondents said they did have a hardware, service or repair problem within the past 12 months; this figure is a little better than the overall average of 21 percent. With an average problem severity rating of 64, the company also does a little better than the overall average of 67.

Up 6 percent from the average, 79 percent of the people who report a problem say their disk was either impaired or unusable within the past 12 months, and when you consider that the Western Digital disks have been in use for an average of only ten months—while the average disks overall have experienced 18 months of wear—you might assume that over the course of a year even more people would report a problem.

But when something needs to be fixed, the company responds well. With a repair satisfaction rating of 83 (16 points above average), Western Digital beats much of its competition. 83 percent of the respondents say that they were "most satisfied" with their disk repairs, 33 percent over the average.

According to our respondents, Western Digital's 27 technical support representatives are doing their jobs very well. Only 7 percent of the Western Digital respondents have used the manufacturer as the source for technical support, but those people who did give the company a support satisfaction rating of 84. Furthermore, 73 percent of the respondents who used technical support say they were "most satisfied."

"Most of the answers can be found in the manual," says the director of technical support, Judy McCale, "but after we sell our disks to other companies, we're not always sure if the documentation reaches the end user." To combat this, Western Digital has a bulletin board service with the manual on-line, or you can call the company and have a manual sent to you.

Western Digital is currently taking more steps to increase the level of its technical support. Recently, the company installed a telephone tracking system to monitor the status of all technical support calls. McCale says that the new system will help the company to learn about recurring problems with either the hardware or the documentation.

CIRCLE 429 ON READER SERVICE CARD

New Version
Performs defect analysis on
"anything that spins."

Hard Disks Die.

Hard disk manufacturers want us to believe that hard disk technology is absolutely reliable ... but experience teaches otherwise. We depend upon data storage to be flawless, but hard disk technology isn't. Surface defects, head alignment drift, and low-level format aging cause hard disks to fail.

A hard disk drive's low-level format fades with use. The drive's read/write heads lose their delicate alignment and move away from the original low-level format information. These new data track locations intersect unseen surface defects that were once harmlessly located between tracks. DOS's chilling "Abort, Retry, or Fail?" message inevitably results. Precious data is soon lost.

If left unchecked, data storage becomes more an act of hope and faith than one of science.

A return to science. The problem is known and understood, and the solution is clear. While a drive's data can still be read, the drive must be given a new, realigned and strong low-level format. Then all current surface defects must be located and managed.

This process prevents hard disk data loss.

An act of prevention. Gibson Research Corporation's SpinRite™ software program reads hard-to-read and impossible-to-read data from a DOS hard disk, nondestructively low-level reformats the drive's surface while optimizing the sector interleave factor, analyzes and scrubs each track of the drive for surface defects, and relocates any endangered data to safety. SpinRite easily restores hard disk drives to better-than-new condition with their data intact. Before any data is lost, SpinRite detects that a drive is "softening"

then determines and eliminates the cause. SpinRite readily recovers data that the system cannot read.

SpinRite won Byte Magazine's prestigious Award of Distinction and

continues to win computer industry praise and acclaim. It has proven itself to be effective in preventing hard disk failure. SpinRite will work for you.

SpinRite II features a detailed technical log, as well as support for DOS 4 and large device driver partitions. It is available immediately from local software retailers or directly from Gibson Research with a 30-day satisfaction guarantee.

Suggested retail price: \$89.

To receive additional literature or to purchase SpinRite II, call toll-free:

SpinRite II.

A return to science.
An act of prevention.

(800) 736-0637.

CIRCLE 162 ON READER SERVICE CARD



HEAVY PROBLEMS ARE BEST HANDLED BY PEOPLE THAT CAN MAKE LIGHT OF THEM.



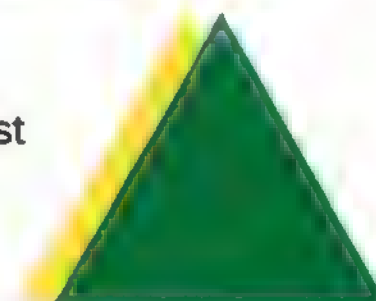
Today's business-computer users face a myriad of problems. Cost accounting and business analysis. Computer-aided design. Management of corporate data. Production of presentation materials. And work-group networking.

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I N F O R M A T I O N S Y S T E M S

CIRCLE 525 ON READER SERVICE CARD

Rob Peter to Pay Paul



NORTON USERS: Upgrade to
MACE UTILITIES Version 1990
for just \$50!

"Mace Utilities, Version 1990: Emergency Room Pushes Aside Norton's Disk Doctor"

"...it can get you out of hot water while other programs are vainly attempting to save the day"

- Edward Mendelsohn,
PC MAGAZINE Associate Editor

Now that the jury is in, a lot of people who bought Peter Norton's Norton Utilities Advanced Edition wish they had bought Paul Mace's Mace Utilities Version 1990 instead.

It's easy to understand. In announcing its prestigious Editor's Choice Award, PC Magazine noted that The Mace Utilities Version 1990 "repairs damage that nothing else has the nerve to even look at."

Well, here's good news. If you bought Norton Utilities, just "rob" the title page from the User Manual, and we'll upgrade you to Mace Utilities Version 1990 for just \$50. That's \$100 off the retail price, right now!

Not only is The Mace Utilities Version 1990 the acknowledged leader in recovering lost or damaged hard disk data, it also includes many extra features like virus protection and "smart" recovery of dBase and word processor files - performing fully automatic (and reversible) diagnosis and repair with no user assistance.

Why go without the *ultimate* hard disk utilities any longer? Just send us the title page from your Norton Utilities manual (any version) and your check for \$50. We'll rush your copy of Mace Utilities Version 1990 back to you.



Owners of any other disk utilities program can take advantage of the same offer.
Credit card owners can upgrade by calling 1-800-873-4384.

Offer will expire on October 31, 1990.
CIRCLE 236 ON READER SERVICE CARD

FIFTH GENERATION SYSTEMS The Creators of FastBack

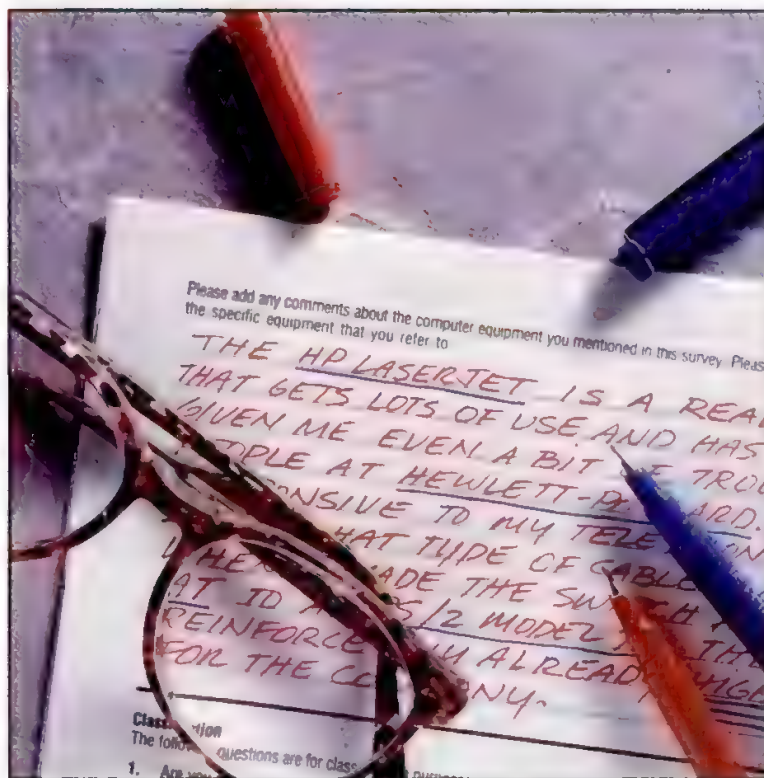
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COVER STORY

We've all had the experience: you've spent three days writing the biggest report of your career. You've run your spell-checker and loaded your finished text file into your desktop publisher. You've carefully laid out your pages, added pie charts, and scanned in your photos. You have an hour to spare. Now all that's left is to cross your fingers, pull down the File menu, highlight Print, click on your mouse and wait for . . . *clunk-clunk . . . harummmph . . . beeeeeep!*

Your printer's LCD says Paper Jam.



PHOTOGRAPH: PETER NEUMANN

PRINTERS

MAKING GOOD MARKS

Fifteen minutes of pulling out paper shreds brings no relief, so you decide to print it on the network. Nothing doing: the network printer is down. Your office mate's printer is low on toner and has been printing little black blotches for weeks. You call your printer manufacturer's tech-support line and, as the tech-

F

rustrating as printer breakdowns may be, at least they tend to be few. And although printers exhibited a host of minor problems, on the whole they turned out to be models of reliability.



PRINTERS

support operator puts you on hold and, as you listen to the Muzak, you start thinking of ways to run your meeting without that report. Maybe you can draw up some flash cards with that box of crayons your three-year-old daughter gave you for your last birthday. . . .

END OF NIGHTMARE

Luckily, according to the 17,699 steadfast souls who gave us the skinny on printers from 17 different manufacturers, that kind of nightmare occurs only once in the proverbial blue moon. In fact, printers turned out to be among the healthiest components in our survey respondents' systems, and when they did develop trouble, our respondents seemed to take those difficulties in stride. Overall, print-

ers garnered a solid 92 reliability rating (out of a possible 100).

On average, 19 percent of the printers described in our survey responses had a problem that impaired or prevented their use, as compared with hard disks at 21 percent, CPUs at 41 percent, and laptops at 34 percent. Only graphics adapters (at 11 percent) and monitors (at 14 percent) bested the printer category in this area. Moreover, the average severity rating ascribed to printer problems was relatively low: only 44.

These figures are especially heartening when you consider that for all our printer respondents, the mean length of use for a printer is nearly two full years,

with about half those printers shared by at least two people. All of which lends credence to what manufacturers like to claim: that these highly engineered collections of gears and motors and magnets and rollers and circuit boards are indeed built to last.

THE BREAKDOWN ON BREAKDOWNS

The largest portion—10,452, to be exact—of those printers are dot matrix. As a group, they receive a 92 reliability rating for the mean 24 months they've been in use.

Want better news? Our survey respondents' 3,645 laser printers fare slightly better than the overall average with a reliability rating of 93. Keep in mind, though, that our survey respondents have

HEAD TO HEAD: COMPANIES COMPETE ON SERVICE AND RELIABILITY



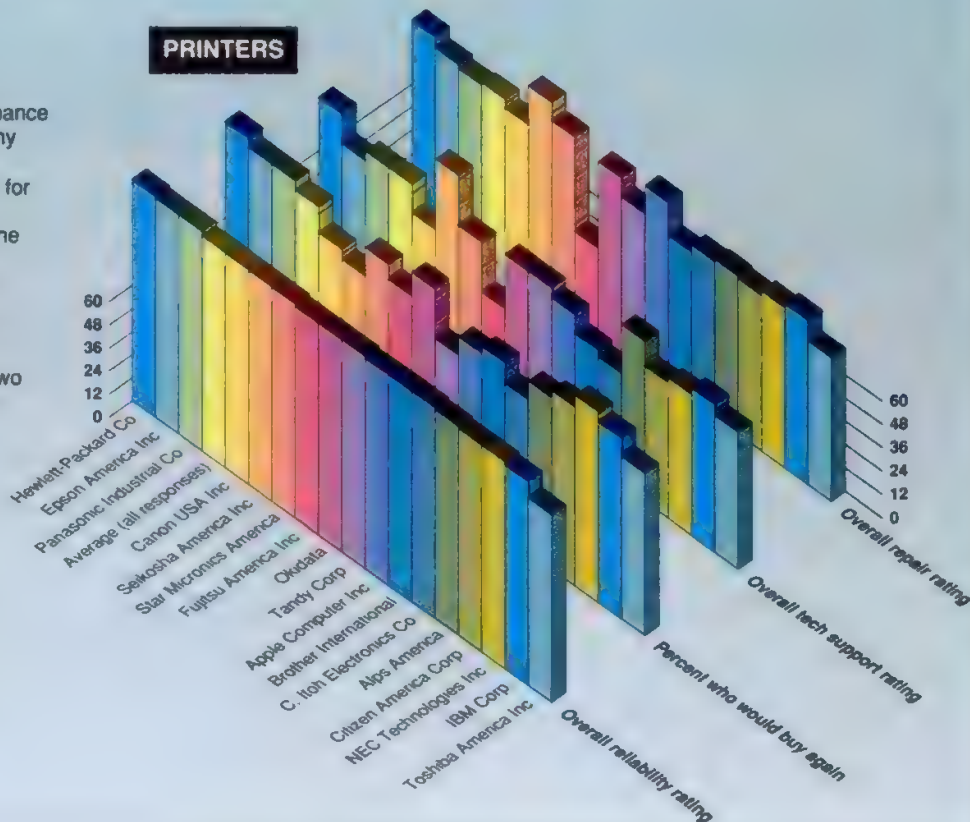
Hewlett-Packard took honors in the printer category with the highest overall reliability rating, edging out Epson and Panasonic by 1 point and surpassing the average reliability rating for all printers by 3 points. Hewlett-Packard printer owners proved themselves a highly loyal bunch, leading HP's nearest competitors—Epson and Panasonic once again—by a healthy 4 percentage points.

Even though few of the printer companies' service and support mechanisms were anything to brag about, our surprise winner was Seikosha in both categories. In fact, a number of Davids found themselves ranked over the Goliaths in tech support and repair service, proving that in at least some cases, biggest or best-known doesn't always equal best.

This 3-D bar chart gives you the chance to compare at a glance the company scores for four questions:

- How would you rate the product for overall reliability?
- Would you buy a product from the same manufacturer again?
- How satisfied were you with the technical support you received?
- How satisfied were you with the repair service you received?

The first question and the last two call on respondents to give a rated response based on a scale of 1 to 5, which we converted to a more familiar 1 to 100. For the second question, though, each result indicates the percentage of respondents who answer yes. Note that answers to the first two questions come from all those responding for a given company or product. For the last two questions, however, those answering are a subset of the total respondents—only those persons who tried tech support or had a repair problem.



PRINTERS

been using their laser printers for a mean of 15 months: 9 months fewer than the overall average.

The reliability sweepstakes winners are the ink jet printers, with an average reliability rating of 95; 3 points above the average for all printers. Even though they've been in use for a mean time of only 11 months, ink jet technology apparently holds special promise for reliability among printers.

MS. AND MR. FIX-IT

Our survey respondents list numerous printer problems, ranging from broken printheads and faulty paper-feed mechanisms to jammed ribbons and leaking toner cartridges. For the most part, however, respondents consider these problems routine and do not let them affect their view of their printer's overall reliability. Also, no particular problem stands out overwhelmingly. (For a list of common printer problems and their symptoms, see the sidebar "When Good Printers Go Bad: A Rogue's Gallery of Printer Problems.")

Of the 17 percent of our respondents who have experienced problems, only a third have chosen to use the manufacturer's repair service. The average satisfaction rating for manufacturers' repairs (whether done at a repair depot, satellite service center, or through an authorized dealer) is surprisingly low: 64 points.

Nearly half of these 17 percent, however, have chosen to fix the problem them-

Seikosha have received a rating higher than 70 for technical support. The average rating for manufacturers is 62. Survey comments back these numbers up: many users have written to tell us of their disappointment with manufacturers' telephone support, claiming that tech support operators are often unable to answer specific questions about specific machines. Another pet peeve is inability to help with software support.

One welcome exception to this is Hewlett-Packard's Computer Peripherals Division, which maintains an entire group dedicated to handling software support for HP's laser and ink jet printer lines.

THE WINNERS: HP, EPSON

Some companies, like AT&T, Texas Instruments, and QMS simply do not garner enough responses to warrant their inclusion here. As you might expect, certain other manufacturers are well represented.

Epson, with 4,197 responses, dominates the dot matrix group with strong reliability numbers and above-average buyer loyalty. This is true as well of Hewlett-Packard (3,640 responses) in the laser and ink jet categories. Panasonic and IBM are statistical powers to be reckoned with as well, garnering 2,888 and 1,053 responses, respectively. More surprising is the performance of several smaller or lesser-known printer manufacturers like Star

most visible causes of computer users' headaches—is happily not one of the most frequent. And although technical support and repair service have some way to go to reach the levels of satisfaction that users get from the printers themselves, most of our survey respondents made it to their meetings on time with clean, crisp paper output in hand.

ALPS America

by Laura Cox

COMPANY SCORES

3553 N. First St.
San Jose, CA 95134
(408) 432-6000 (sales)
(800) 950-2577 (technical support)

Actual score Average score High-low range

ALPS America, a privately held computer printer company that manufactures page and dot matrix printers, has been serving its customers since 1985. According to Larry Jameson, analyst for BIS Capital International, ALPS is among "the top 15 of nearly 50 dot matrix competitors."

Although ALPS manufactures page printers as well, our survey data allows us to look only at ALPS's overall printer line and its dot matrix printers in particular. We are unable to distinguish ratings for specific models. Worth noting is the fact that ALPS's most popular printer, the Allegro 24, received a *PC Magazine* Editor's Choice award in the October 31, 1988, issue.

RELIABILITY

ALPS receives an overall reliability rating of 89 for its printers and a reliability rating of 90 for its dot matrix printers. Both scores are about average for their groups.

According to respondents who used their printers for at least a year, ALPS's printers—including the dot matrix line—have been out of commission slightly more often than those of most printer companies in our survey: figures indicate that the failure incidence is 3 percent higher than

The average satisfaction rating for manufacturers' repair service is surprisingly low: 64 points.

selves. This response is consistent with another finding: nearly four-fifths of those answering our survey either chose their own printers or influenced their company's buying decision. A highly educated group (nearly a third claim graduate or professional degrees), our respondents willingly undertake their own repairs. Indeed, our respondents seem happiest when they take matters into their own hands: satisfaction with their own repairs exceeds that for the manufacturer by no less than a full 20 points.

SUPPORT WOES

Of the 17 printer manufacturers covered in this section, only Hewlett-Packard and

Micronics and Seikosha. Those of you who subscribe to the *Avis* maxim will discover that these companies try harder, too—and with fine results.

More importantly, we have discovered from their comments that while current printer owners in our survey expect to hang onto their printers for an average of about two and a half years, their next printer is likely to be a laser printer. With the cost of owning and maintaining these powerful little beasts dropping sharply in recent months (see "A \$1,000 Laser for Every Desktop" *PC Magazine*, June 12, 1990), this prediction looks like a sure bet.

Ultimately our survey respondents have taught us that printer failure—one of the

PRINTERS

average for ALPS printers overall and higher than the overall average for the company's dot matrix line.

Nonetheless, Jack L. Espinal, a logistics officer for the National Guard Bureau in Maryland, who uses an ALPS P2000G dot matrix, indicates he probably wouldn't buy another ALPS printer. "It does an excellent job," he says, "except for paper feeding. If I have a long file to print, I cannot leave the printer and expect to have a good copy."

According to Dick Maxi, manager of ALPS' technical support, ALPS is aware of the problem with this particular printer. "The ribbon wasn't passing smoothly through the printer gears," he says. Maxi believes the problem has since been resolved.

STRONG TECH SUPPORT

Technical support is ALPS's strong point, according to our respondents. Although not enough ALPS printer owners have responded to yield significant numerical data in this question category, trends in the data indicate that ALPS owners are generally more satisfied than the average. According to Dick Maxi, there's a good reason: "We're not the biggest, so we have to try to service our customers more effectively than others."

Good communication between ALPS's tech support team and its dealers and third-party repair organizations is one key to ALPS's apparent tech support success. ALPS's newsletter, *Tech Alert*, offers insight into technical issues and any recent changes that third-party service providers and authorized dealers should know about.

But ALPS doesn't automatically hand responsibility for tech support and repair to others. "If ALPS's third-party or authorized dealers can't help solve a customer's technical problems, word comes back to me," says Maxi, "and I do whatever it takes to help resolve the problem, personally, if I have to." ALPS is also looking into bulletin board support for its various dealers.

FEWER BUY-AGAINS

Despite the high rating they have given technical support, only 73 percent of the respondents for ALPS—a figure 10 points lower than the overall average—say they will purchase from ALPS again. What accounts for this below-average buy-again figure? One factor may be the lower percentage of those steering buying decisions among the respondents as a group.

Since many ALPS printers are sold to government agencies, fewer of these users have a say in determining the brands or models purchased. In fact, only 59 percent of the respondents for ALPS are responsible for selecting the manufacturer or model, compared with an average of 78 percent overall.

GROWING RECOGNITION

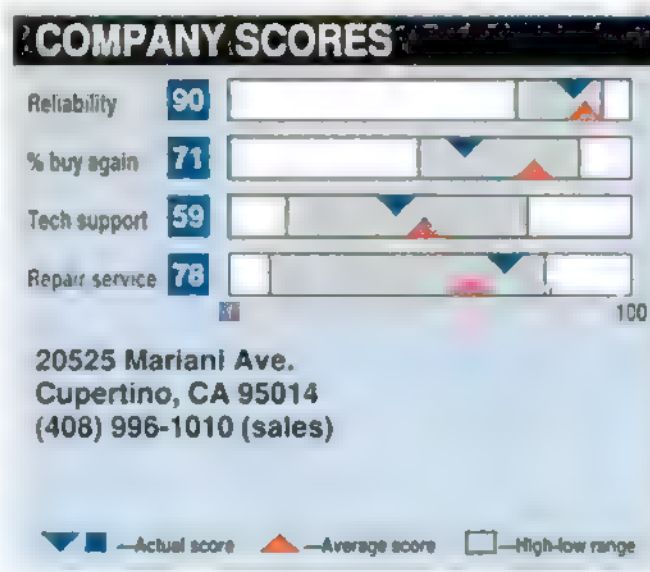
Nevertheless, the tide may be turning. Though the numbers appear to indicate otherwise, some respondents feel extremely loyal toward ALPS. Dr. Ronald A. Burnett, Director and CEO of New Horizons Institute in Springfield, Missouri, told us that his "ALPS Allegro 24 is an excellent printer" and that he would buy from ALPS again.

BIS International's Jameson sums up the challenge ALPS faces: "There are a lot of people out there who have never heard of ALPS, but it is growing in recognition." Perhaps our next survey will reveal how much headway ALPS has made.

CIRCLE 631 ON READER SERVICE CARD

Apple Computer Corp.

by Tom Unger



Those unused to seeing the name "Apple" in these pages may be surprised to learn that there is a sizable number of Apple ImageWriters and LaserWriters sitting on desktops next to IBM-compatible PCs, cabled to those PCs' serial ports. Apple printers are also accessible to IBM-compatible PCs via TOPPS networks, as well as through a variety of other networks. And although we did not garner enough responses to analyze individual Apple

printer models, we are able to make some general judgments about our respondents' experiences with the company.

SOLID RELIABILITY

Apple printers score a solid 90 reliability rating, only two points below the average for all printers. This relatively strong rating is supported by the majority of comments we have received. For example, Charles Himowitz, chief applications engineer for Intusoft in San Pedro, California, has his Apple LaserWriter hooked up to a 20-MHz Compaq 386 via a TOPPS network and is enthusiastic in his support. Says Himowitz: "The Apple LaserWriter blows the Hewlett-Packard LaserJet away in every category. The LaserWriter is a workhorse and a top performer. We've used it steadily for three years and it's never made a peep." Eric Kok, a business analyst for AMP in Harrisburg, Pennsylvania, agrees: "Our networked Apple LaserWriter IINT printer has been fantastic working as a production printer for our department."

Of those IBM-compatible PC users who are satisfied with their Apple printers, some wish that making the connection from IBM to Apple and back again was easier and better documented. Most notably, Ernest Colantino, a computer textbook author from Abrams, Wisconsin, tells us his "Apple LaserWriter IINTX is a nice printer, but there should be more support and information for IBM-compatible computer owners. Some Apple dealers are not at all helpful, and you can't call Apple and get help." Kate Paisley of Apple's public relations department acknowledges this, but adds: "All our support and service is directed through dealers, but we do have dealer training and certification programs. As for IBM compatibility, that kind of support would be up to the individual dealer."

Apple does appear to be doing more to improve its printers' access to more markets. According to Paisley, in July of this year Apple has begun to offer a ROM upgrade for the LaserWriter IINTX, which includes a new version of PostScript that enhances the printer's capabilities, particularly in multivendor environments. These improvements include software switching for ports and emulations, improvements to the HP LaserJet emulation, and an updated user manual with sections dedicated to use of the IINTX in non-Macintosh environments.

Apple printers fare a bit better than

average in terms of our respondents' reporting of their problem incidence percentage. Of Apple respondents, 18 percent express at least one problem, as opposed to 19 percent overall. These users have been working with their Apple printers only one month less than the 23-month mean for all printers in our survey.

LOW BUY-AGAIN

Nevertheless, Apple loses ground when we ask whether its printers are meeting our respondents' current needs, and even more so when we ask our respondents whether they would buy from Apple in the future.

Of those who answered the question, "Does the item meet your needs?" 75 percent have responded affirmatively—8 percentage points lower than the overall average for printers. And those who say that their printer does meet their needs expects that it will continue to do so for an additional 30 months, against an overall mean for printers of 31 months. In a separate question, 84 percent of our survey respondents note that their printers have lived up to their original expectations—1 point below the overall average for printers in our survey.

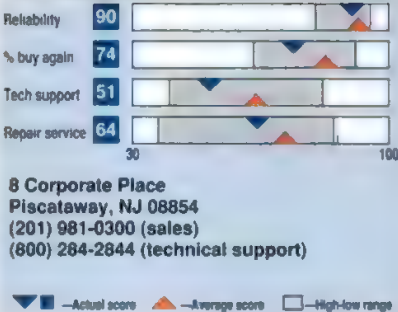
When asked if they will buy from Apple in the future, only 71 percent say they will, as compared with an 83 percent average for all printer respondents in our survey. This sizable dip in buy-again percentage may well be attributable, among other things, to the difficulties our respondents have had creating output with an Apple printer in their IBM-compatible environments.

Another factor that may affect Apple's buy-again rating is its warranty policy. Until March of this year, Apple offered only a three-month warranty on its prod-

Brother International Corp.

by Laura Cox

COMPANY SCORES



Brother has been manufacturing dot matrix printers since 1970 and now markets a full line of daisy wheel, dot matrix, and laser printers. Among them are its widely selling HL-8e laser printer and its brand new HL-4 laser printer. Although we did not receive enough responses to analyze the numbers for individual Brother models (see "Numbers You Can Trust: How Much Is Enough?"), we were able to assess our survey respondents' reactions to the company overall.

GENERAL SATISFACTION

Brother has achieved a 90 rating for the overall reliability of its products, 2 points below the average rating for all printers. This score reflects current customer satisfaction levels, although owners of early Brother printers were not always so happy.

Dr. Neil Lewis, president of Lewis Associates in Marietta, Georgia, told us

compatible software packages available. The Twinriter 5 was replaced by the Twinriter 6, another dual printhead printer. Both have since been discontinued, though Brother claims it still supports the two.

CITING PROBLEMS

Brother's printers show a 19 percent incidence of failure in our survey, even with the average for printers overall. And although the number of respondents reporting problems is too low to report, we did notice some possible trends. Those responding with problems cite an average of five occasions in the past 12 months when their Brother printer was unusable. This compares to the average for all printers of one time in the past 12 months.

To Brother's credit, however, its machines have been in use an average of six months longer than the average for all printers, possibly accounting for a slightly higher incidence of major failures.

TECH SUPPORT

Surprisingly, those who have turned to Brother for technical support have found it wanting. About a third of our respondents who have used Brother's tech support phone lines say they were not at all satisfied. Jimmy Flythe, president of Flythe Construction Co. in Raleigh, North Carolina, tells us that Brother makes an excellent printer "but their tech support hot line, both end user and OEM phone lines, are manned by personnel lacking both technical and communication skills."

Flythe adds that he spoke with five different representatives and was given five different answers to his problem, none of which was correct.

According to one Brother customer service manager, each technical support member undergoes extensive training. "If there is a problem with a Brother printer we want to know about it."

Daniel Duncan, Science Department Chairman of Locke High School in Los Angeles, does indeed like his Brother HL-8e but notes, "The only problem [with Brother] is getting supplies and accessories, since our local computer outlets don't carry them."

Brother informs us that its new 24-hour automated consumer help line will give you the location of the nearest service center and will even take your order for replacement ribbons and accessories. Brother is also attempting to resolve shortcomings in technical support by using a checklist as a way to troubleshoot.

Apple's low buy-again percentage among our respondents may reflect the complexities of using Apple printers in IBM environments.

ucts. Says Kate Paisley of Apple's public relations department, "We've now extended that warranty to 12 months." Apple expects that change, and its recent LaserWriter IINTX upgrade, to have a strongly positive effect on its IBM-oriented customers' perceptions of Apple's commitment to support and service.

CIRCLE 632 ON READER SERVICE CARD

that his Brother Twinriter 5 exhibited "poor spacing, bad hits on capital letters with its proportional spacing wheel, and takes ribbons that cost \$29 each."

Roger T. Nakagawa, senior vice president for Brother's Information Systems Division, explains that the Twinriter 5 was Brother's very first model with dual print-heads and, at the time, there weren't many

WHEN GOOD PRINTERS GO BAD: A Rogue's Gallery of Printer Problems

by Rink Murray

Barney Fife, Deputy Sheriff of Mayberry, R.F.D., once said, "If it's not one thing, it's another. And if it's not the other thing, it's the one thing. And if it's not either one of them, then it's something else." Deputy Fife might have well have been talking about printers. Serious problems in printers are generally rare but, just as in Mayberry, anything can go wrong. And when one thing does go wrong, watch out, because one problem often leads to another.

Listed here are the major problems most often found in dot matrix and laser printers. In terms of repair, the two differ as much as their technologies. One of the major differences between them is that in dot matrix printers, the malignant parts can usually be extracted, repaired, and returned. This is not as true for laser printers. When something goes wrong with a laser, there isn't much that a user can do but buy new parts. And as you can see, they aren't always cheap.

The prices quoted here do not include what is often the most expensive aspect of repair: labor. And by no means is this a complete catalog of the things that can go awry. "However," as PC Labs' system support manager Charlie Rodriguez says, "you can escape most of these problems through simple, proper maintenance. If you keep your printer clean, you'll avoid a lot of trouble."

DOT MATRIX DOWNERS

PRINTHEAD (\$75-\$300)

SYMPTOMS

- ✗ One dot or a row of dots is missing in your text.
- ✗ A solid line runs through your text.
- ✗ The printhead sticks to your ribbon, tearing it and preventing it from advancing.

INSIDE STORY

Unfortunately, the printhead is generally the most expensive part of the printer to replace. More annoying, when it goes bad it can damage other parts of your printer as well. Most printhead problems result when a printwire—one of those little pins that presses a portion of the ribbon against the paper—fails. When this happens it often causes a corresponding overload on the

printer's circuit board. If one of these symptoms occurs, shut your printer down immediately. In this way you'll minimize the damage to the transistors and chips on your printer's circuit board.

To mitigate the cost of replacing an entire printhead, you might consider sending it to a printhead doctor. Two companies that specialize in repairing and refurbishing printheads are Impact Printhead Services of Austin, Tex., (512) 832-9151, and North-Star Matrix of Minneapolis, Minn., (800) 969-0009.

PAPER ROLLER (\$10-\$15)

SYMPTOMS

- ✗ Printer destroys paper.
- ✗ Paper jams.

INSIDE STORY

Paper jams are the most common problems associated with dot matrix printers. They're also the most easily remedied. If your paper jams, shut off the printer immediately to avoid burning out motors and breaking the printhead assembly belt. If you experience

this problem on a regular basis, check the print gap settings to make sure you're using the proper gap for the thickness of your paper. And note that it may not be the print gap: some printers refuse to print on paper that is too flimsy or too thick.

Also, since the tractor feed and friction feed can conflict with each other, check to make sure that both aren't engaged at the same time.

CIRCUIT BOARD (\$150-\$300)

SYMPTOMS

- ✗ Printer behaves erratically.
- ✗ Printer refuses to print at all.

INSIDE STORY

If your circuit board malfunctions, you don't always have to replace the whole thing. Usually circuit boards can be repaired easily by replacing the faulty transistor or chip. Here the expense is incurred through the labor required to locate the problem. Ask your repair technician. If the labor is going to exceed the cost of a new board, you might as well bite the smaller of two bullets.

THE INSIDE STORY ON YOUR DOT MATRIX PRINTER

Damaged parts of dot matrix printers can often be repaired rather than replaced. Printheads can be refurbished for less than their up-to-\$300 replacement cost, and circuit boards can be examined for faulty transistors and the like (though the labor for this can sometimes exceed the cost of a new board). But, as in laser printers, one bad element can trigger the failure of others. When paper jams or printhead problems occur, the key to saving the machine is immediate shutdown.

Paper roller (\$10-\$15)

Printhead (\$75-\$300)

Circuit board (\$150-\$300)

LASER LOSERS

PAPER ROLLERS (\$3-\$5)

SYMPTOMS

- ✗ Paper jams.

INSIDE STORY

Paper jams in laser printers sometimes occur when the Teflon coating wears off the rollers that pull the paper through the printer. When this happens, there isn't a great deal you can do about it except replace the whole roller. Fortunately, rollers are inexpensive and Teflon has a pretty long life, so most users won't have to worry much about this problem.

CORONA WIRES (\$10-\$15)

SYMPTOMS

- ✗ Printer turns pages gray.

INSIDE STORY

The electromagnetically charged corona wire is what attracts the toner to the paper. As you print, some leftover toner will collect beneath the corona wire in the bottom of your printer. Laser printer manufacturers have developed various schemes to blow this overage away from the corona wire and

collect it out of harm's way, but no scheme is 100 percent effective. And if the toner gets on the wire itself, the wire begins to heat. At higher temperatures, the power supply has to work harder to charge the wire. This can be a devastating blow to both your power supply and the fusing assembly. To avoid this problem, it's a good idea to clean your printer regularly. Refer to your printer's manual for proper cleaning procedures.

HIGH-VOLTAGE POWER SUPPLY AND FUSING ASSEMBLY (\$200-\$500)

SYMPTOMS

- ✗ Printer produces black or blank pages.

INSIDE STORY

If you go to the trouble of keeping your printer clean, power supply and fusing assembly failures are a pretty rare occurrence. Regrettably, if one goes, it usually causes the other to blow, too.

TONER CARTRIDGE (\$69-\$89)

SYMPTOMS

- ✗ Printing quality is not consistent across the entire page.
- ✗ Blotches appear on the page.

INSIDE STORY

The toner cartridge is the equivalent of the ink in a dot matrix printer's ribbon. The difference is that once the ink in a ribbon is gone, you either reink the ribbon or buy a new one, whereas if the toner cartridge's nozzle is clogged or the cartridge is low, the distribution of toner might not be consistent across the page, even though there's plenty of toner left. See your printer's manual about cleaning the nozzle.

OPTICAL DRUM (\$200-\$400)

SYMPTOMS

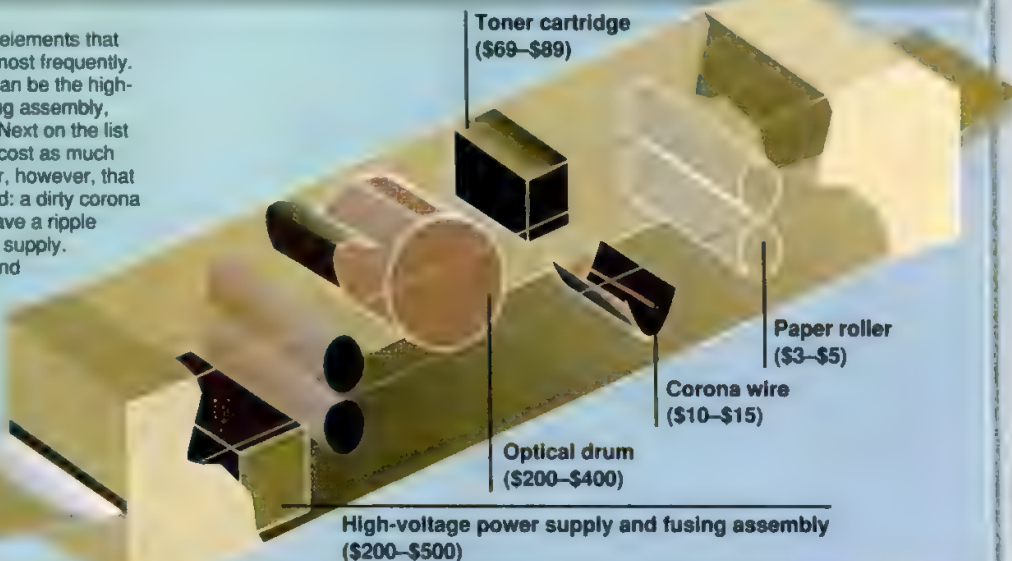
- ✗ Characters smear, or blotches appear on your paper.

INSIDE STORY

Although the drum is the most expensive part of your laser printer, the problems that are associated with it aren't always serious. If dark scratches appear on your paper, it means that your drum is either dirty or scratched. A dirty drum is easy to fix: just follow the instructions in your manual and clean it. And it's a very good idea to keep the drum clean anyway because if you don't, you might scratch it. If that happens, you'd better be ready to pull out the old check-book.

THE INSIDE STORY ON YOUR LASER PRINTER

In laser printers, there are five elements that require repair or replacement most frequently. The most expensive of these can be the high-voltage power supply and fusing assembly, which can set you back \$500. Next on the list is the optical drum, which can cost as much as \$400 to replace. Remember, however, that no laser printer part is an island: a dirty corona wire that costs only \$10 can have a ripple effect that can zap your power supply. In any case, simple cleaning and maintenance can often stave off disaster.



SERVICE AND RELIABILITY PRINTERS

BUY AGAIN

Jimmy Flythe adds that poor technical support will not stop him from buying another Brother printer. In fact, he praises his HL-83e laser printer, which was named a *PC Magazine* Editor's Choice in our November 14, 1989, issue. And Brother's printers have lived up to the expectations of 81 percent of our Brother respondents, only four points below the average for all printers in the survey.

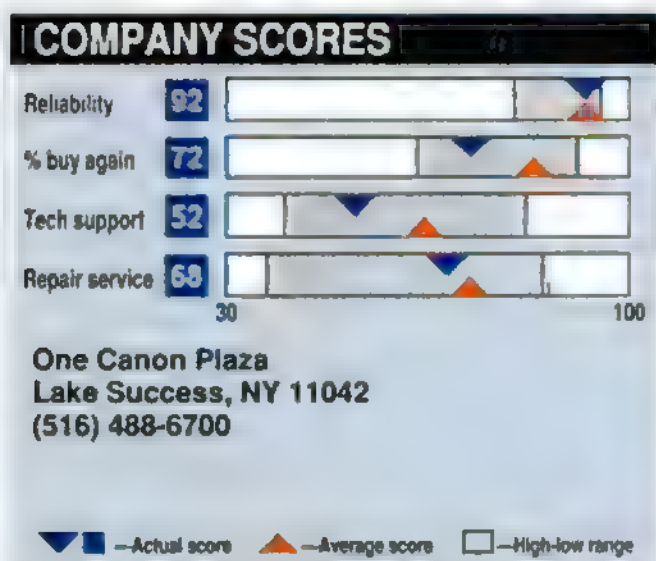
Oddly, only 74 percent of our survey respondents say they will buy another Brother printer, as opposed to an overall buyer loyalty rating for printers of 83 percent. What accounts for this 9 percent difference?

Perhaps one of the reasons, according to Sally Byrnes, Brother's product marketing specialist for printers, is because Brother makes mid- to high-end printers but "is constantly being compared to the low-end market. When you compare prices, Brother loses out a lot of the time."

CIRCLE 633 ON READER SERVICE CARD

Canon USA Inc.

By Lisa Reittinger



Canon has extended its high-tech expertise in the business arena to calculators, electric typewriters, copiers, and laser printers. In fact, Canon makes the print engine for many of the laser printers on the market.

Canon's high name recognition, its reliability rating of 92 (same as the overall average), plus comments like "outstanding," "excellent," and "fine" from our survey respondents, make it difficult to understand why many of the Canon printer users we heard from will not choose to buy another printer from Canon. Yet 72 percent (versus 83 percent overall) indicate that they won't.

TECH SUPPORT WEAKNESSES

Even though only 17 percent of Canon printer users (just 2 points below the average) report difficulties with their printers, of all the companies we looked at, Canon has the highest percentage of respondents who have used the tech sup-

Canon's Steve Tyson: "The original Canon manuals were indeed the pits. You would have to be an engineer to figure them out. But . . . the newer manuals are fine."

port hot line. While it appears that many of the Canon respondents who have never had a hardware, service, or repair-related problem would kiss the desk their printer sat on, those who have encountered problems do not seem very satisfied with Canon's technical support.

Merlyn E. Doleman, a retired vice president for the Bank of America in Orinda, California, tells us that although tech support was readily available, Canon's tech support staff "did not seem well informed." Irv Thomas, president of Succinct Systems in Norwich, Vermont, comments that "both marketing and tech support seem unable to handle moderately technical questions."

SOFTWARE SUPPORT

Even users who have glowing compliments about the Canon printers say that the lack of widespread software support is enough to tempt them toward the Hewlett-Packard line. Sam Tattnall, vice president for Scherrer Resources, a small software company in Bedford, New York, tells us, "As far as software support, one would have to be a fool not to be tempted by Hewlett-Packard."

In response, Steve Tyson, a Canon technical support representative, explains, "We can help only if we are familiar with the software package in question, and we couldn't possibly know all the packages." Adds Tyson, "Many software packages have not caught up with our software drivers, but we are endeavoring to provide widespread support." Sam Tattnall, who works for a software company, agrees: "Canon has been aggressive in getting companies to support its software."

In what may be a related trend, 75 percent of the users (8 percentage points below the overall average) tell us that their Canon printer meets their needs. This figure may reflect some Canon owners' dissatisfaction with software support.

Canon is working as well to improve its repair service. According to Judy Fairbanks, a Canon public relations represen-

tative, Canon's new ASF (Authorized Service Facility) program for dealers should greatly increase the number of dealers with strong knowledge of Canon printers. Says Fairbanks: "Dealers are now required to go through a detailed training program to become authorized service facilities. The dealers know more and are better able to recognize and solve problems."

DOCUMENTATION WOES

Aside from their unhappiness with the quality of Canon's tech support, many respondents have found other areas lacking. J.W. Wall, from New York, writes, "Canon's manuals are superficial and totally unhelpful, as is its technical support." Wolfgang Kurth, of The Last Word in Cambridge, New York, is also disappointed with Canon's manual, describing it as "confusing and redundant," and also "lacking in certain information."

Canon's Steve Tyson acknowledges the documentation problem. "The original manuals were indeed the pits. You would have to be an engineer to figure them out. But for the most part the newer manuals are fine, and we haven't received any complaints about them. Those customers who are having trouble must have the original manuals, and their complaints regarding them certainly are justifiable."

VERY ATTACHED

Nevertheless, those who feel that the printer meets their needs believe that the product will continue to meet these needs for two and a half years, right on the average for all printers.

Monte Davis, the Creative Director for Paladin Communications Ltd., in

PRINTERS

Brooklyn, New York, tells us that his printer will continue to meet his needs "until the next whiz-bang-boom breakthrough in technology." And Daniel V. Jones, a supervisor of graphic design for the graphics section of the Minneapolis Planning Department, says that his printer will be useful to him "until it melts its way through my table."

CIRCLE 634 ON READER SERVICE CARD

C. Itoh

by Joseph J. Antinori

COMPANY SCORES



2515 McCabe Way
Irvine, CA 92714
(800) 347-4017 ext. 4424 (C-Tech Electronics)
(800) 877-1421 (CIE America Inc.)
(800) 347-4027 (Image Systems Inc.)

■ Actual score ▲ Average score □ High-low range

C. Itoh Electronics Co., a top-ten supplier of computer printers and manufacturer of terminals and other peripherals, announced a major reorganization effective March 1, 1990. Three companies—C-Tech Electronics, CIE America, and Image Systems—now market and distribute the complete range of printers formerly grouped under the C. Itoh name.

Since C. Itoh had originally been a marketing creation formed to sell printers manufactured by three separate Japanese concerns, the move is less radical than it might seem. But in many ways, the new order is more straightforward: CIE America will handle the CI line of heavy-duty dot matrix business printers manufactured by the Citizen Watch Company. C-Tech Electronics will specialize in the popular ProWriter line of PC dot matrix machines made by the Tokyo Electric Company. And Image Systems will market the Mega line of high-speed laser printers produced by Olympic Optical.

Representatives from all three companies, in separate interviews, have praised the reorganization as logical and waste-cutting. In like fashion, our respondents' opinions would seem to indicate that there is plenty of room for improvement in the old system. And while we did not receive enough responses to evaluate C. Itoh

products individually, our pool of 148 users is enough to generate significant data about the products en masse.

It is not surprising that only 65 percent of those polled say they would buy a C. Itoh printer again—18 percent below average.

End-user technical support will be affected by the reorganization, but since service for the most part will continue to be handled by the same authorized service centers, these findings will still be valid in most areas.

POOR RATINGS

Our survey shows an overall average reliability rating of 90 for C. Itoh, just 2 points below the average for all printers. However, an unusually high number—26 percent—of C. Itoh respondents have had problems with their machines, and a substantial number of those problems have been rated "very serious."

Problems cited most frequently included printhead failure, paper-feed difficulties, ribbon snafus, and general dissatisfaction with performance. In fact, almost every distinguishable variety of problem is represented in the C. Itoh group relative to the data as a whole.

These difficulties are borne out by our respondents' comments. Glen Midkiff, a programmer with the Defense Logistics Agency in Columbus, Ohio, says, "I've had a problem with the C. Itoh ProWriter C315XP since I got it. It was worked on by the retailer but never really fixed. I wouldn't buy C. Itoh again." Not that everyone is unhappy with their machine. Our survey also produced comments like these from Dick Dunbar, an architect in Bainbridge Island, Washington: "My ProWriter 8510 has been a great surprise and a real workhorse over the past four years. Cheap, too."

Nevertheless, the survey results tend to indicate that Midkiff's experiences are a bit too common to be overlooked. Our C. Itoh users are less happy with the repair service they receive from their Itoh center than printer owners as a whole.

Taking all of this into consideration, it is not surprising that only 65 percent of those polled say they would buy a C. Itoh printer again—a figure 18 percent below the average. The severity of that statement

is mitigated by the fact that the average age of a C. Itoh printer currently in use hovers around the four-year mark. Clearly, many Itoh owners are ready for an upgrade.

C. ITOH, THEY ARE A-CHANGING

C. Itoh has obviously recognized the difficulties involved in trying to support and train service personnel to deal with three different makes of machines and has taken steps to make its operation more efficient. For example, Dan Jones of Image Systems' technical support group notes that he now answers only questions pertaining to the laser machines and is better able to specialize. Image Systems' repair service, handled on-site by NCR, has garnered a high degree of user satisfaction.

Both CIE America and C-Tech have increased their technical support staff at their toll-free 800 numbers and will operate training sessions independently to certify their repair centers. Shogo Homma, president of the parent company, C. Itoh & Co., Ltd., summarizes the reasons for the new structure as follows: "These new layers of support will translate to increased sensitivity to market demand and improved customer support." C. Itoh owners, current and future, are hoping he's right.

CIRCLE 635 ON READER SERVICE CARD

Citizen America Corp.

by Margaret Piemonte

COMPANY SCORES

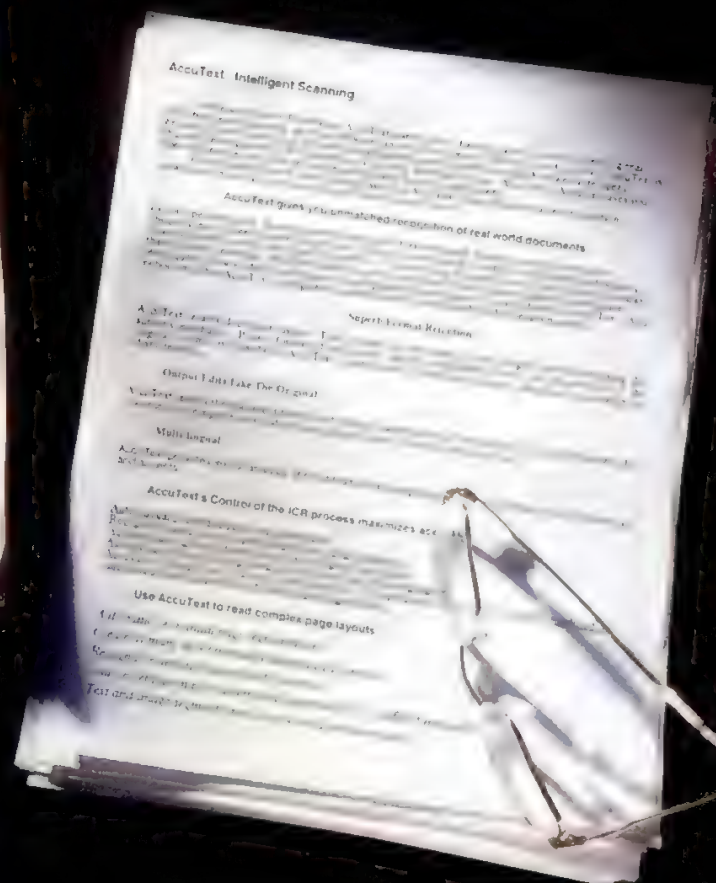
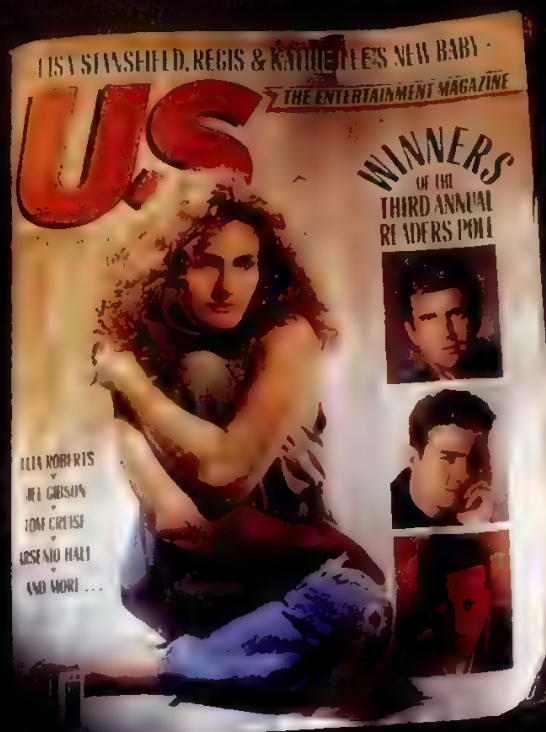


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■ Actual score ▲ Average score □ High-low range

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CIRCLE 247 ON READER SERVICE CARD



PRINTERS

first thought may be watches. Indeed, Citizen is the world's largest manufacturer of watches and other timepieces. However, the company has been diversifying. In 1984, Citizen created a subsidiary, Citizen America Corp., located in Santa Monica, California, to produce medium-speed dot matrix printers for the U.S. market. Its printers include the HSP line (9-pin dot matrix with optional color) and the 120D (9-pin dot matrix).

In 1989, Citizen introduced two low-end "Color-on-Command" dot matrix printers, the 200GX (9-pin) and GSX-140 (24-pin), which display menu choices on an LCD panel. Bob Adam, Citizen's director of marketing, tells us, "We haven't been able to keep these two printers in stock since we've started selling them."

RELIABILITY

Survey respondents who rated Citizen dot matrix printers give them an average reliability rating of 90, just 2 points below the overall average for dot matrix printers. Their comments back these numbers up; a sampling reveals a group generally satisfied with their printers' overall performance and reliability. One owner tells us that the 120D "exceeds my expectations. It's a great machine!" Another, Rick H. Rogers, manager of production training at Astra Pharmaceuticals in Westboro, Massachusetts, says his 120D "is a peach! I took it out of the box three years ago and have done nothing to it but change the ribbon."

On the other hand, there are several Citizen respondents in our survey who have had problems with their printers. Robert F. Black, a systems supervisor in Costa Mesa, California, says his "three Citizen MSP55s would go into the self-test mode for no reason in the middle of a print job." And Joey Rodrigue, a system engineer with J. Driscoll & Associates in Dallas, Texas, complains that "the print-head failed and the paper handling is poorly designed."

TECH SUPPORT

For the most part, our survey respondents indicate that they are satisfied with Citizen's tech support and repair service.

Yet, although our sample sizes for those responding to questions about technical support and repair service are too small to be statistically accurate, response trends show that Citizen has had its share of complaints in these areas. For example, Tim Romance, payroll manager of Pepsi-

Cola Bottling Co. in Buffalo, New York, who called tech support to ask a question about his printer, feels like he "was getting the runaround, and had trouble getting in touch with Citizen's service because the number was changed."

Douglas Becker, a systems programmer, also had trouble reaching Citizen. He remembers Citizen as "having an 800 number, which was much more efficient."

Peter Washburn, a Citizen customer service manager, counters these reports: "We usually have a favorable response to our technical staff. Your survey respondents' comments must have been referring to very specific instances."

"Technical support service and reliability are very important to us," Adam comments. He further explains that "an automated technical support telephone system was implemented to improve

customer service and give technicians more time. It now handles about 75 to 80 percent of the calls."

Adds Washburn, "Coming in August of 1990 will be a bulletin board service for priority customers so that they can bypass the automated telephone system."

REPAIR SERVICE

Citizen does not maintain its own repair facilities; instead, owners of Citizen printers rely on authorized dealers or third-party repair organizations such as Bell Atlantic Business Systems Services (formerly Sorbus).

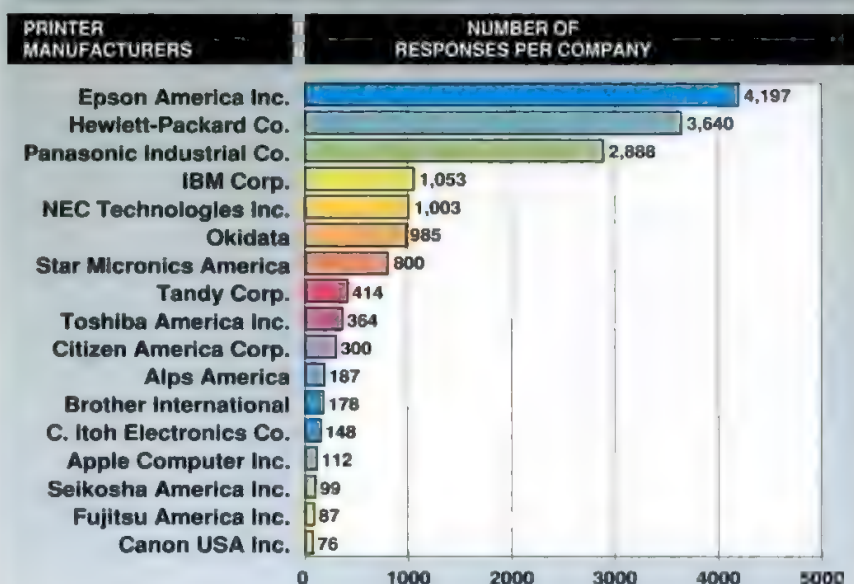
Perhaps the ultimate question facing any manufacturer in this survey is whether or not those who responded for a given company say they will buy from that company again. On this important scale, Citizen doesn't fully measure up: 77 percent

NUMBERS YOU CAN TRUST:
HOW MUCH IS ENOUGH?

Nearly 73 percent of our 17,699 printer responses were accounted for by The Big Five: Epson America, Hewlett-Packard, Panasonic, IBM, and NEC. Okidata and Star Micronics America also came in near the 1,000 mark, whereas Canon USA, Fujitsu America, and Seikosha America just made the cut with under 100 responses each.

This chart displays the number of responses each manufacturer of printers received in our March 27 Equipment Satisfaction Poll. In this issue, we review manufacturers that garnered 75 or more survey responses, the minimum number required for the results to be statistically sound. Where companies of special interest with fewer than 75 responses are reviewed, their ratings should be used with caution because of the small base sizes.

RESPONDENT BASE



PRINTERS

of the Citizen respondents say they will buy from Citizen in the future, fully 6 percentage points lower than the average for all printers included in our survey.

And while those numbers do not necessarily reflect a catastrophically low customer loyalty level, it will be interesting to see how Citizen's tech support changes affect its standing next time around.

CIRCLE 836 ON READER SERVICE CARD

Epson America Inc.

by Oliver Rist

COMPANY SCORES



23530 Hawthorne Blvd.
Torrance, CA 90505
(213) 373-9511
(213) 539-9140 (sales and technical support)
(800) 922-8911 (dealer information)

—Actual score —Average score —High-low range

Since its 1975 debut appearance in the United States, Epson has manufactured products spanning all areas of the micro-computer industry. But where the company has won its commanding name recognition is with its line of dot matrix printers. Its best-selling printers, shipping in the hundreds of thousands each year, are the LX-810 and LQ-510, Epson's low-end entries into the 9-pin and 24-pin dot matrix market.

Laser printers are a relatively new endeavor for Epson. It introduced its first entry near the middle of last year, the EPL 6000. Designed as a personal laser printer, the EPL has done well in sales, but it is still too early in the printer's life cycle to make any accurate determinations about its reliability.

Asked where Epson's plans lie for the laser market, Peter Bergman, director of the printer business unit at Epson, says, "Look at Epson's strategy for printers in the past. So far, Epson's game plan has been to introduce a high-quality low-end model first and then build a full fledged product line around it. You'll be seeing bigger, faster PCL and PostScript lasers from Epson in the future."

THE LX AND FX SERIES

Those Epson customers who have bought LX models are extremely pleased with them. LX reliability is rated at 96, and buy-again, at 88 percent, is 5 percent above average. Only 6 percent of LX users report any problems with their printers, 11 percentage points below the dot matrix average, and 13 percentage points below the overall printer average.

The FX series was designed for heavier, more business-oriented use than the LX series. Predictably, these printers fare as well as any Epson with the company's customers. Reliability is rated at 94, and 87 percent say they will buy another Epson machine. Jay Mendell, a professor of public administration at Florida Atlantic University tells us, "I bought my Epson FX-100 used three years ago. I didn't even get a manual. It's worked flawlessly since then... I'm devoted to Epson."

Only one Epson model has proven to be an anomaly. The FX-86e received exceptionally low scores, especially in tech support and buy-again ratings. In fact, Epson discontinued the 86e in 1988, and its replacement, the FX-850, has been as successful as any other Epson printer.

THE LQ SERIES

In view of the growing interest in personal laser printers, 9-pin dot matrix printers could very well be going the way of the dinosaur. If the dot matrix market is to survive at all, most feel 24-pin is the way to go. Here's where Epson's LQ series knocks firmly at the front door.

Not surprisingly, the results for the LQ line shine just as brightly as for the rest of Epson's armada. Reliability rates a solid 93, and a full 87 percent of LQers say they will LQ again if given the chance. Jim Zaenger of Pittsburgh, Pennsylvania, says of his LQ-1500, "I like it. I also wouldn't choose a personal laser over the LQ, because only the LQ has the wide-carriage abilities I need. And it hasn't given me any trouble in over four years."

TECH SUPPORT, WHEREFORE ART THOU?

Tech support is the only area in which Epson does not score solid marks overall. Its tech support satisfaction rating is only 52—10 points below the overall average in our survey.

Jan Marciano, a spokesperson for Epson, says, "Tech support is still one of our

most difficult sections. We still stock parts for and service our first printer, the MX-80. Add that kind of product line to our huge customer and reseller base, and we easily get a thousand calls a day. It's hard keeping that many people happy all at once."

Keeping all those people happy might be easier if Epson had a technical support hot line, but, like Compaq, the company

Epson America Inc.

Epson LX Series



Epson FX Series



Epson FX 86E



Epson LQ Series



Epson LQ-800



—Actual score —Average score —High-low range

generally relies on its distributors to service its products. According to Marciano, if a customer is in need of service and can't return to the dealer from whom the unit was purchased, the Epson 800 sales line can give the customer the names and locations of three nearby dealers. If these do not satisfy, then the customer can call a second time, get three more names and the Epson corporate toll number.

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CIRCLE 350 ON READER SERVICE CARD

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SERVICE AND RELIABILITY

PRINTERS

Dick Bulot, Epson America's vice president of customer support says, "I'm a little surprised and disappointed with your results for our technical support. We do survey our end users, and they've always rated us as excellent. We really want to take care of the customer as much as possible."

Bulot says that Epson's customer service will improve, but cautions: "We realize that many customers would like to see an 800 number, and we want to help as much as possible, but we have no plans to install one at this time. We've looked at possibilities for both a 900 number and a bulletin board, but I won't say those will be appearing in the definite future, either. We have recently surveyed our retail servicers and divided them into two categories. Level one servicers will provide more support than level two, and if customers do call the toll number, we will only be referring them to level one servicers from now on."

CIRCLE 637 ON READER SERVICE CARD

Fujitsu America Inc.

by Margaret Piemonte

COMPANY SCORES



3055 Orchard Dr.
San Jose, CA 95134
(619) 481-4004 (technical support)
(800) 826-6112 (sales)

▼ Actual score ▲ Average score □ High-low range

Fujitsu America Inc.'s Computer Products Group, based in San Jose, California, is no stranger to the printer market. Fujitsu America is the largest subsidiary of Japan's premier computer manufacturer, the Fujitsu Corp. Its product group in the United States designs, markets, and supports a broad range of computer and telecommunications equipment such as tape drives, substorage systems, various computer peripherals, and flexible disk drives. The printer line is highly recognized for its dot matrix printers and well known for its high-end laser printers.

Because our sample sizes are too small to report on individual Fujitsu printers, our survey numbers can only describe the company's performance overall.

MIXED NUMBERS

Fujitsu printers have an average reliability rating of 91, one point lower than the average for printers overall. This strong rating is backed up by our respondents' generally positive comments. One respondent writes: "The equipment is flawless, rugged, and bulletproof."

Yet our survey numbers seem to conflict. For example, 17 percent of those respondents who own Fujitsu printers claim to have had a service- or repair-related problem with their printers—a figure 2 percent lower than the average for all respondents with printers. However, in contrast, trends indicate that those who do experience problems find those problems more severe than average printer respondents.

TECH SUPPORT BACKLOG

When they need help, our group of Fujitsu respondents tends to rate Fujitsu's technical support well below average. Their comments appear to back this up.

Says Gordon Jacobson, president of Portman Services Inc., "Fujitsu's tech support people have never been able to get a handle on how to do service right." Jacobson does not find the same to be true of his printer, which he characterizes as "flawless. And the print quality is excellent."

In response to these and other tech support complaints, Thomas Speak, Fujitsu's vice president for sales and marketing, says "The company is aware that there seems to be a problem, and we are doing everything possible to change. Since January the number of calls that tech support receives has greatly increased, thereby causing a serious backlog on our 800 number." Speak does not supply a reason for the sudden increase in calls. "And," Speak adds, "Fujitsu is currently working on a voice mail system that will hopefully handle about 40 percent of the calls. We do put our engineers in contact with our customers if necessary."

Lucille Harendza, marketing communications manager for the Fujitsu America Inc. Computer Products Group, describes Fujitsu's commitment to its printer customers: "After purchasing a Fujitsu printer, the user is automatically enrolled in Fujitsu's Technical Information Prod-

PRINTERS

uct Support (TIPS) program for unlimited telephone support during the warranty period. TIPS is designed to assist the user with setup installation, hardware and software interface problems, and to answer questions about operation."

LOW BUY-AGAIN NUMBERS

Perhaps because of these complaints, the number of our survey respondents who plan to buy again fell out at 74 percent, 9 percent lower than the overall average for printer buyers in our survey. This mixed finding is further supported by a sampling of our respondents' comments.

Says Lawrence Barbieri, president of Logical Consultant, "I didn't get the expected results when the printer was in the Epson mode, but I love its paper handling." David M. Judd, a physicist, provides more mixed reviews: "the printer was overpriced but the quality was good."

Given the generally reliable nature of Fujitsu machines and the changes afoot in Fujitsu America's Computer Products Group, we'll be looking for improved support numbers, as well as stronger brand loyalty, the next time we ask our readers' opinions.

CIRCLE 638 ON READER SERVICE CARD

Hewlett-Packard Co.

by Tom Unger

COMPANY SCORES



19310 Pruneridge Ave.
Cupertino, CA 95014
(415) 857-1501
(208) 323-2551 (technical support)
(800) 752-0900 (sales)

■ Actual score ▲ Average score □ High-low range

Is Hewlett-Packard too good to be true? This company, known as well for computers and calculators, sold its first personal desktop laser printer in 1984 when it introduced the now-classic HP LaserJet. According to its most recent figures, Hewlett-Packard claims to have shipped well over 2 million personal laser printers, at last count, and judging from our survey respondents, those printers have stood up well against hard use.

RELIABILITY & BUYER LOYALTY WINNER

As a company, Hewlett-Packard takes top honors in reliability, netting a 95 rating (out of 100), 3 points above the average reliability rating for all printers. And a whopping 91 percent of our respondents who own Hewlett-Packard printers say they would buy from Hewlett-Packard again. This figure beat the average for all printer manufacturers by 8 percent, and Hewlett-Packard's nearest competitor in this category, Epson America, by 4 percent. Consider that only 63 percent of our respondents who own Tandy printers will buy from Tandy again, and only 77 percent of IBM printer owners will buy from IBM again, and you will see just how powerful Hewlett-Packard's customer loyalty is.

Our respondents' comments are generally as enthusiastic as their numerical assessments. Joseph Colavito of Tucson, Arizona, tells us that his two "LaserJets are about five years old and incredibly reliable. They grind out tons of paper every day and never go down." Donna Jadis, a Microcomputer Specialist at the V.A. Medical Center in West Haven, Connecticut, has "installed HP DeskJet printers for PC, Macintosh, and VAX mainframe use throughout the Medical Center. Their ease of use and quiet printing are among the DeskJet's most valued features."

LOW PROBLEM INCIDENCES

Each of the three Hewlett-Packard LaserJet models for which we received enough responses to make numerical comparisons has a lower percentage of problem incidences than the 20 percent average for all laser printers in our survey. The LaserJet Series II and IID clock in at 16 and 18 percent, respectively, the LaserJet Series IIP, in use for a mean length of time of only five months (against a 15-month mean for all laser printers) has a 13 percent incidence.

Naturally, no printer is perfect, and some of our respondents find their LaserJets lacking. Bruce Frumerman, president of Frumerman and Myers, a New York City communications marketing firm, has had little but headaches with his HP LaserJet Series II printer. Frumerman tells us that the printer has averaged three on-site repairs a year for the past three years. "We've had every removable piece in the printer replaced at least once," says Fru-

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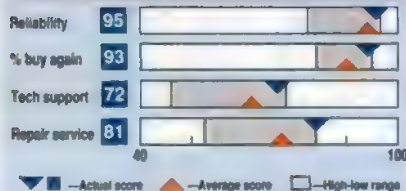
HP LaserJet Series II



HP LaserJet IID



HP LaserJet IIP



STRONG SUPPORTERS

Hewlett-Packard's average overall support rating is 76, 14 points above the overall printer average, and among the highest of all the manufacturers in our printer survey. 73 percent give Hewlett-Packard a 4 or a 5 (on the 1-to-5 survey scale), whereas only an average 56 percent of respondents rate other manufacturers as highly.

Susan Copple of Hewlett-Packard's Personal Peripherals Support Group tells us that there are reasons why people are so satisfied with HP's telephone support. "We average just under 60,000 calls a month," she says, "and half those calls are software related. Even though we don't support calls about individual pieces of software, we do support our printers' functionality within that software. If you need to know how to set up your copy of *WordPerfect* for use with one of our printers, we can tell you how to do it." She adds that even though Hewlett-Packard does not run its own bulletin board service, "we maintain an HP forum on CompuServe, and we also maintain a fax network, where customers can dial in and have detailed instructions sent to them via their own fax machines."

In keeping with its high support ratings, Hewlett-Packard scored well on overall satisfaction with manufacturer's repair service. Hewlett-Packard received a rating of 79, 15 points above the average rating for repair service for all manufacturers.

This may be one case where biggest does indeed equal best.

CIRCLE 639 ON READER SERVICE CARD

IBM Corp.

by Tom Unger

COMPANY SCORES



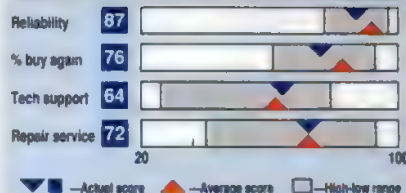
Contact your local authorized IBM dealer.
(800) 426-2468 (dealer information)

Actual score Average score High-low range

Although IBM, which introduced its IBM Graphics Printer in 1984, is one of the largest sellers of printers in our survey, it didn't receive as many responses as did Epson, Hewlett-Packard, or Panasonic. And while it was fourth in the number of printer survey respondents, IBM comes in

IBM Corp.

IBM Proprinter Series



a surprising second-to-last in terms of reliability. It fares better in technical support and repair service, as well as with those who plan to buy from IBM again, but is not a front-runner.

SECOND TO LAST

IBM receives a reliability rating of 87 from its 1,053 survey respondents—5 points below the overall average for printers. This is the only score higher than Toshiba's 80 rating, and it is 8 points lower than the reliability winner in our printer section, Hewlett-Packard. Yet, like Hewlett-Packard, there are those among our respondents who would stand by their IBM printers for good, and this was a phenomenon that we noted especially for older IBM printers which, like Okidata's Microline 92, represented to our respondents a bygone era of printer engineering excellence. Says Ronald Hasenyager of Lafayette, Indiana, "My IBM Graphics Printer is indestructible. It's the one hold-over from my original IBM PC system." Richard Rusho of Rochester, New York, is equally pleased with his Proprinter. Says he: "My IBM Proprinter XL24 with its fontset module does a tremendous job."

These glowing reports aside, a variety of complaints about jamming paper-feed mechanisms (which had a 4 percent rise above the average for all printers), among others, contributes to IBM's 25 percent overall problem incidence percentage—6 percentage points above the average. It should be noted, though, that the average mean length of usage for all IBM printers is 6 months higher, at 29 months, than the overall average for printers, a factor that might well influence problem-incidence percentages.

merman. "We've had the printer under a service contract practically since the day we got it. We've had problems even Hewlett-Packard couldn't solve."

Those problems include mysterious toner marks on the paper and problems printing on the second side of the page—difficulties that have persisted after complete overhauls. Tom Old, manager of the Customer Satisfaction Group in the Hewlett-Packard Personal Peripherals Support Group in Boise, Idaho, tells us that Hewlett-Packard uses what it calls an "escalation process" for machines showing repeated failures. Says Old: "We're looking at instituting the same sort of service escalation process for our dealer network as well, but with about 1,000 field service engineers and nearly 1,800 dealer engineers to keep track of, it's quite a job." Old adds that "every machine has a distribution of failures. Some machines never fail, while others fail more than average. In any case, we want to hear about it when it happens so that we can track problems as they occur and take care of them as quickly and as equitably as possible."

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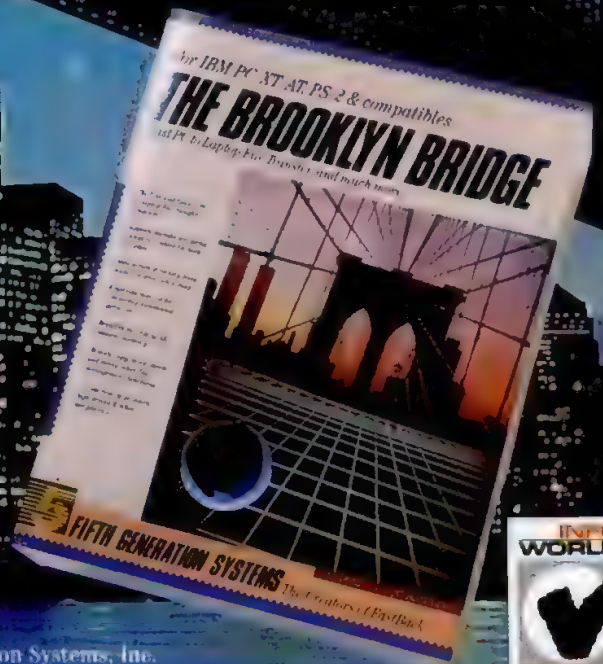
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PRINTERS

PROPRINTER XL24 COMPLAINTS

Not everyone has been as happy with the Proprinter XL24 as Mr. Rusho. In fact, of all the IBM printers about which we are able to report, the XL24 has both the lowest reliability rating (79) and the highest incidence of problems (39 percent).

The comments detailing respondent complaints were legion. Says William C. Bryant of Middletown, New Jersey, "The IBM Proprinter has given me more minor problems in two years than my Teletype 43 has in ten years. The lack of documentation for routine adjustment and minor problem solving is extremely bothersome." Dale Harcherik, database manager for the Yale Psychiatric Institute, tells us that she has "two Proprinters, and each of them jams regularly." J.T. Bryant, a member of IBM's marketing support group, acknowledges these problems, saying that: "While we don't know that the 24-wire printers jammed any more often than the other printers, there was a sense that the way to fix a paper jam was not fully documented in the manuals." Therefore, Bryant adds, "if the first time the printer jammed it wasn't cleared properly it would probably continue to jam up. This may be why many of your respondents experienced problems in that area."

Larry Waxler, systems manager for the Office of Sponsored Research at the University of Southern Maine in Portland, disagrees. Says Waxler: "Our seven Proprinter XL24's jam all the time, even when they're completely clear. I tell my people to use only heavy paper, and to make certain the paper path is straight and completely unobstructed."

BUY-AGAIN PERCENTAGE SOFT

Our respondents indicate that they would be less likely to buy another IBM printer than the average for our survey. 77 percent say they will buy from IBM again—6 percent below average for all respondents with printers. The varied woes of the Proprinter XL24 do not appear to deviate from this trend. 76 percent of our respondents with XL24s say they'll buy from IBM again. Of those respondents with Proprinter IIs, 80 percent give IBM the thumbs-up.

BETTER SERVICE AND SUPPORT

In general, when IBM printers have needed support and/or service from IBM, our respondents have been fairly satisfied. Those calling on IBM for technical sup-

port give it a rating of 63—1 point lower than the average for all printer manufacturers. Respondents are less satisfied with their retailers' support, rating them a mediocre 59, 4 points below average. Here, too, trends show the Proprinter XL24 scoring below the overall tech support average for printers. IBM fares better than average on manufacturer re-

tions to form one single support system. This is mainly a reseller program, however—a field organization that works with dealers."

With a reliability rating of 88, NEC's line of dot matrix printers—the Pinwriter series—come up only 4 points below the average reliability rating for the dot matrix category. However, to our surprise, NEC's Silentwriter LC 890 achieves only 79 points—14 points below the overall

Of all the IBM printers about which we are able to report, the Proprinter XL24 has both the lowest reliability rating (79) and the highest incidence of problems (39 percent).

pair ratings, scoring a 71 for all its printers, 7 points above the overall printer manufacturers' average.

Still, there are those among our respondents who are not happy with IBM's service. Waxler tells us that the main circuit board on his Proprinter XL24 blew "at least three times until they discovered it was a faulty power supply. I was pleased with the way I was treated, servicewise, but you'd think it wouldn't take four tries to get it right."

CIRCLE 640 ON READER SERVICE CARD

average for laser printers and 13 below the average reliability rating for printers in general.

LASER MODEL TROUBLED

A number of people have spoken of a variety of problems with the NEC Silentwriter. In fact, respondents who use one give the model a problem incidence rating 39 percent higher than the average for laser printers: 59 percent versus 20. The most frequent complaint is "marks on the paper," mentioned by 12 percent—a full 10 percent above the average for that problem.

Their comments are in keeping with our survey numbers. "The photoconductor cartridges have a large number of spots on the drum. These transfer spots to the printed page," says Larry McKinley, technical publications supervisor of Sheffield Measurement in Dayton, Ohio. "I'd say 25 percent of these cartridges are defective." Other respondents also complain about marks on the drums, as well as cartridges that are easily scratched and damaged.

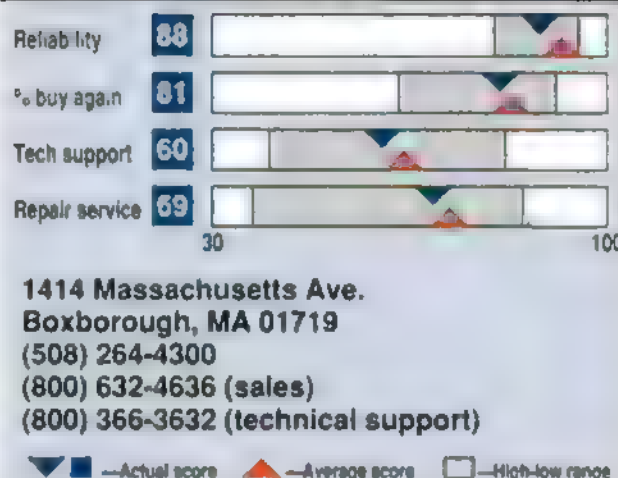
John Macintire, NEC's director of printer product marketing, assures us that "Although we did suffer some problems with the early 890, we did fix all of the problems. We had one bad batch of drums, but we recalled them."

Our survey respondents also report problems in NEC's dot matrix printers—especially the paper feed on the P5200 and P5300. In fact, the Pinwriter 5300 shows a 10 percent higher incidence of problems than average for the dot matrix category (27 percent versus 17).

NEC Technologies

by Cristina Cordova

COMPANY SCORES



At the end of 1989, NEC Information Systems and NEC Home Electronics merged to form NEC Technologies, which now manufactures printers, desktop PCs, monitors, and laptops. Ron Janusz, vice president of tech support, says, "We've combined the strengths of two organiza-

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PRINTERS

There have been complaints about defective ribbons and print tape as well, especially with regard to the P2200. "Any time I buy a box of six NEC ribbons, anywhere from three to four of them don't work," says Joe Harpaz, computer consultant for Harpaz Enterprises in Bergenfield, New Jersey. Another respondent complains that only the original ribbons that came with the printer have produced acceptable print.

"That boggles my mind, because they're the same ribbons," responds NEC's John Macintire. "They are all built in the United States and are very high quality ribbons. We've never had any complaints. This one completely blows me out of the water."

SERVICE AND SUPPORT CONFUSION

NEC functions through dealer service in over 1,500 locations. However, many survey respondents complain about dealer service. One unhappy end-user from Boston writes that his "NEC P5200 dealer is not knowledgeable about the details of the printer. I had to call NEC directly. They were quite good with their answer but told me I should go to the dealer in the future. This was awfully confusing."

Other respondents for NEC complain about the unsatisfactory performance of local service centers. NEC has 13 walk-in centers around the country and offers on-site repair through resalers in 29 cities. Although the company tries to work mainly through dealers, the number of respondents whose printers carry service coverage through NEC warranties is much higher than average. Indeed, most respondents use NEC for tech support and repair service.

Although 20 percent of those who responded that they use a NEC printer also use NEC's hot line—7 percent above average for all printer users in our survey, the hot line received only an average rating of 60—7 points lower than average for all hot line users. This may reflect NEC's support philosophy. Says Ron Janusz, "It's important that we leave the message that our primary support is through the resalers' services. We've put another layer behind that—a safety net."

Except for Pinwriter 5300 users, who come in at 10 percent below the average for NEC, 81 percent of the respondents say that they will buy from NEC again—a figure just 2 points below the overall average. Significantly, the number of people reporting problems with the P5300

in the past 12 months is 81 percent—17 percent higher than those who report problems with the P5200.

BRIGHT SPOT

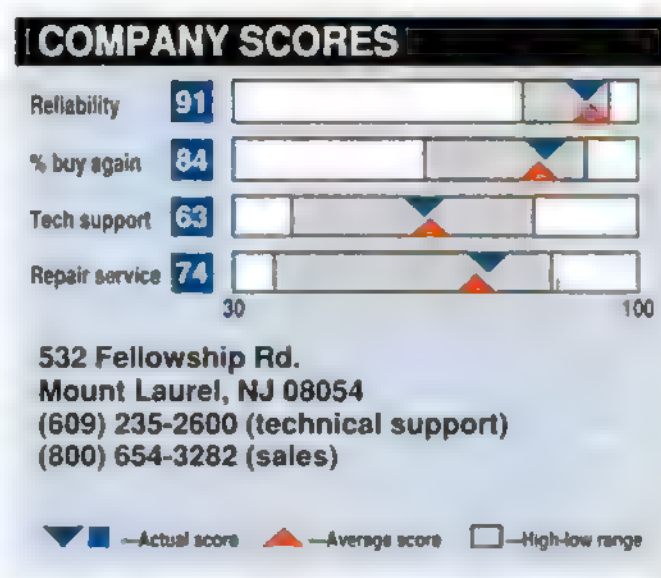
If there is a bright spot in our survey of NEC printers, it may be that NEC has achieved a certain measure of brand loyalty. With the exception of the P5300, the percentages of those respondents who will buy from NEC again are generally within a few points of average. Indeed, 7 percent more Silentwriter LC 890 users feel that the printer meets their needs than do the 83 percent overall average.

And yet another measure of NEC users' confidence is that even with its problems, P5300 users expect to keep their printers nearly half a year longer than the average for all dot matrix printers.

CIRCLE 641 ON READER SERVICE CARD

Okidata

by Cristina Cordova



Okidata is a well-known manufacturer of modems, facsimile machines, and printers—both dot matrix and laser. The company launched its 390 series in the spring of 1988 and its newest printer, the 390 Plus, in January 1990. Because of the many improvements on the 390 Plus, earlier members of the 390 series are being phased out.

NOT ONLY OLDER, BETTER

Some of the most enthusiastic comments on Okidata printers come from users of the old Microline 92, which earns a reliability rating of 94. Respondents who use the ML92 have had it for a mean time of 61 months, three years longer than the overall average time for printer use. Bruce

Schinelli of Chapel Hill, North Carolina, sums up his devotion to his old ML92: "It's a dinosaur in the print world, but it always works and provides good print quality. Hats off to Okidata!"

Not surprisingly, the ML92—one of the oldest printers mentioned in our survey—appears to have had the highest problem incidence percentage of the Okidata printers in our survey: 29 percent of ML92 users report problems—12 percent above the average for all dot matrix printers. However, of those reporting problems in the past 12 months, the ML92 has experienced 34 percent fewer problems than the dot matrix average, outperforming even its newer Okidata siblings by a similar amount.

A high percentage of those problems experienced by ML92 users are caused by the printhead. Cliff Rockwell, Okidata's public relations manager, acknowledges that "when you have a printer for that long, you eventually exceed the printhead's potential."

The Okidata Microline 320 and 390 series receive 91- and 94-point reliability ratings; problem incidence is 22 and 23 percent, respectively. For reliability, these numbers are close to the average in our survey, but for problem incidence, the figures are noticeably higher than the 17 percent average.

The survey shows that Okidata's total problem incidence is also higher than average by 9 percent. The company's best seller to date is the Microline 320, yet 83 percent of respondents report problems and dissatisfaction with the ML320/321 in the past 12 months. This figure is 13 percent higher than average. "The printer frustrates me all the time with idiotic design flaws. Never again, Okidata!" says Dave Kugelstadt, owner of BlueLine Designs, Simi Valley, California. "I think it's second-rate."

OUT-OF-WARRANTY HELP

Although Okidata's technical support is rated lower overall than the average for printer manufacturers, many respondents seem quite pleased with Okidata's support in the long run.

For example, Chuck Riending, president of Standard Plumbing Corp. in Sarasota, Florida, says, "More than three years after my purchase I consulted Okidata's tech-support hot line. Their immediate and friendly service, assistance, and support for a machine well out of warranty convinced me that any printer other than

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PRINTERS

Okidata

Okidata Dot Matrix



Okidata Microline 92



Okidata Microline 320 and 321



Okidata Microline 390 and 391



an Oki is a real mistake."

Indicatively, only an average number out of total Okidata printer respondents state that they will buy from the same manufacturer again. Of those who use the 390/391—and, surprisingly, the 320/321—8 percent more than the average say they'll buy from Okidata again. Indeed, most of those who wrote to us are enthusiastic in their support of the 320 and 390 series. "The new Okidata 391 is excellent! Well thought out logically, convenient, and versatile; I am extremely pleased," says Herbert L. Polak, a consulting engineer. "It's so convenient that you can switch from tractor-sheet paper to single-sheet feed, and the automatic paper cutoff is very effective."

The Okidata printers all seem to have lived up to their end users' expectations, with the ML390/391 rating 7 percent higher than average. Survey respondents rate the ML320/321 and ML390/391 very high for meeting their needs (over 90 percent), while the ML92 printer is 15 percent below the average, probably because of the older printer's age and lack of options.

"I can't say enough good about it. For such a compact, quiet unit (at a very good price at the time), it's been quite a work-horse and has seen a lot of use without ever faltering," says Dr. Robert A. Bounfiglio from South Hamilton, Massachusetts. "I like my little 92—that thing has never missed a beat." Bounfiglio is not happy about the lack of options on the Microline 92, and states emphatically: "Sure, I want them, especially after seeing what the 390 can do. That's why I got one of those, too."

CIRCLE 642 ON READER SERVICE CARD

Panasonic Industrial Co.

by Oliver Rist

COMPANY SCORES



2 Panasonic Way
Secaucus, NJ 07094
(201) 348-7000 (technical support)
(800) PIC-8086 (sales)

Panasonic Industrial Co. markets personal computers, monitors, scanners, optical-disk recording and storage devices, fax machines and boards, and—the subject of this enquiry—printers. Currently, its most popular printer is the KX-P1124.

Panasonic is a big company with a big, satisfied customer base. Panasonic's product quality scores on our survey are either average or slightly higher than average. At 94, its general reliability rating exceeds the average by 2 points. Customer loyalty follows suit: 87 percent say they will buy from Panasonic again—4 points above average.

KEEPS ON CHUGGING

The majority of Panasonic's printer line is composed of dot matrix printers. As a class these printers score a 95 reliability rating, and 88 percent of those respondents who rated them say they'll buy from Panasonic again—4 percent above the

average for all dot matrix printers.

For example, one of its lowest-priced entries is the little KX-P1091i. Reviewed in *PC Magazine's* November 10, 1987, printer blockbuster, the P1091i has been cited for its great price, excellent quality, and solid performance. Three years later, the printer is still around, and opinions are still favorable.

Only 7 percent of our P1091i-using respondents cite a problem. An outspoken and typically satisfied user, Clarkson A. Brown of Franklin, Louisiana, has this to say: "We've had zero problems. These printers run like trains; they just keep on going. It may not be laser quality, but for 300 bucks it's great." Brown's opinion mirrors those of the other respondents.

KX-P1124

Since its introduction in 1988, this has been Panasonic's most popular printer and, according to our survey results, the one people are looking at now if they're considering another Panasonic dot matrix printer. Reviewed in *PC Magazine's* November 14, 1989, issue, the KX-P1124 received our Editor's Choice—a judgment confirmed by the numbers on our survey. Reliability for the printer rates a solid 96, while buy-again receives a stellar 92 percent compared with the 83 percent overall average.

Although there seems to be a problem for some users with the KX-P1124's paper feed, most responses are reflected in David Greenbaum's of Clearwater, Florida. He says, "Overall the printer performed satisfactorily. We had a paper-feed problem, but since that's been fixed it's worked fine."

PANASONIC'S LASERS

Although the 24-pin printer is still Panasonic's best seller to the average PC user, businesses are nowadays mainly interested in laser printers. However, Panasonic's Laser Partner line hasn't performed as well in comparison to other laser printers as Panasonic's dot matrix units have to their competition.

The KX-P4450's reliability is rated at 88, compared with 93 for the laser printer average. Only 81 percent of customers plan to partner up with the P4450 again, as opposed to 88 for other printers.

Terry Shorrock, the senior product manager for printers, notes that "the KX-P4450 is out of production. It's been replaced by the KX-P4450i, which we feel is a much-improved machine. It's got a lot

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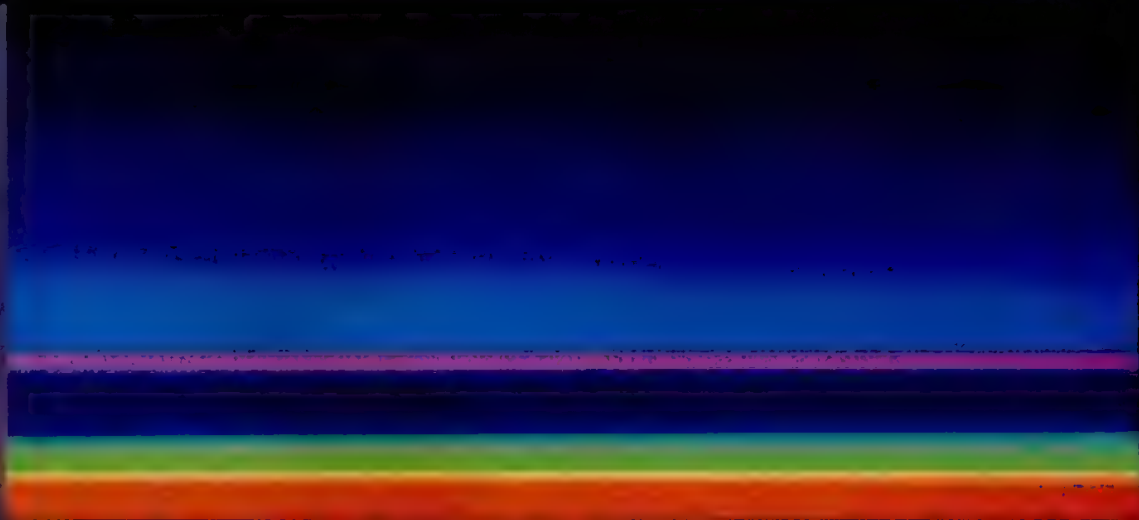
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CIRCLE 142 ON READER SERVICE CARD

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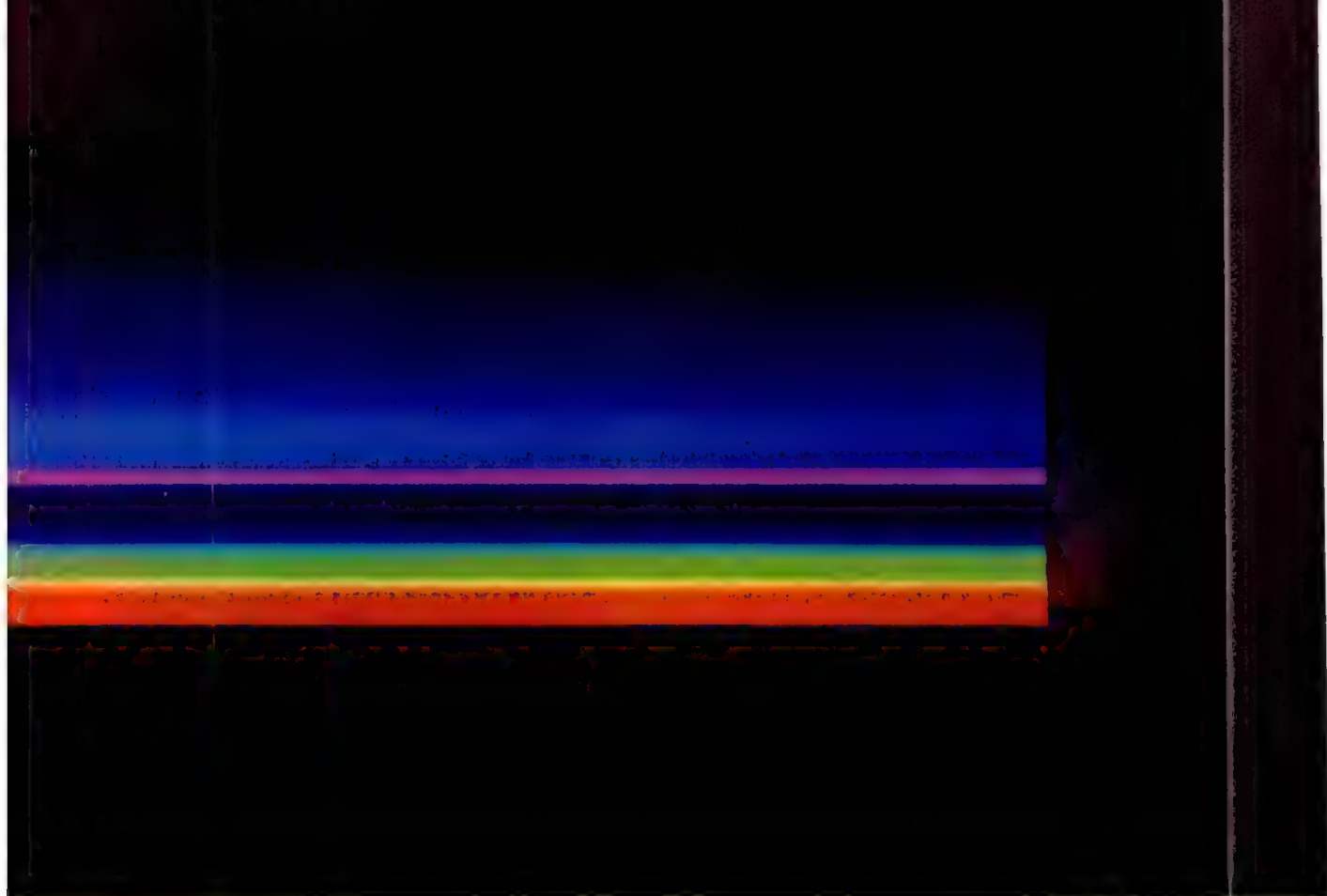
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Panasonic KX-P1091i



Panasonic KX-P1124



Panasonic KX-P4450 LP



Legend: ■ Actual score ▲ Average score □ High-low range

more features that people say they want to see. Besides that, laser printers are much more complex mechanisms than dot matrix printers. Naturally, you're going to see an increase in initial equipment failures. There are more moving and changeable parts. Other than that, though, I'm a little surprised because our surveys have always shown excellent reliability for these machines."

THE TECH SUPPORT BLUES

Laser printer technical support and service satisfaction is the Laser Partners' only true black mark. The KX-P4450's tech support rating is only 47—19 points below average. And its overall service satisfaction rating is only 55, which places it 18 points below average.

Furthermore, Panasonic's overall technical support and service satisfaction ratings don't measure up. Technical support rates at only 52, 10 points below the average. Service is remarkably low, with only a 48-point rating, compared with the 64-point overall average. Presently, Panasonic has one 800 tech-support telephone number, plus three service centers supported

by authorized retail servicers; it also has an arrangement with Xerox as a third-party service organization for all its printer models.

Joe Carny, Panasonic's technical support supervisor, says, "We're very much aware of our problem with technical support, and so is upper management. To help with the 800 problems, we've obtained permission for more lines and six more staffers, though that may increase, too. Our in-house engineering staff is doubling, and we've been upgrading our training in the last months as well—not just for our in-house people, but for our dealer service reps as well. We want to address and resolve this problem by year's end."

CIRCLE 643 ON READER SERVICE CARD

Seikosha America Inc.

by Oliver Rist

COMPANY SCORES



10 Industrial Ave.
Mahwah, NJ 07430
(800) 338-2609 (sales)
(800) 477-7468 (technical support)

Legend: ■ Actual score ▲ Average score □ High-low range

Seikosha America is a \$30 million enterprise that manufactures impact and dot matrix printers, personal computers, computer integration systems, camera shutters, semiconductors, clocks, and other products. Seikosha is a member of the more familiar Seiko Group, one of Japan's leading technological concerns. Seikosha's most popular printer model is the SP-2000.

Guy Perrusio, Seikosha America's service manager, claims that "Seikosha's product quality is about the best in this industry. Our overall defect ratio during the warranty period is only 0.5 percent."

PC Magazine's survey results back up this assessment. Seikosha's overall reliability rating ties with the 92 average for all printers. Numbers on specific problems

are typical: no one problem presents either a major or even a consistent threat. Our respondents report few instances of typical printer glitches, and the number of instances where service was necessary is below the average.

STORED ENERGY PRINTHEADS

Seikosha attributes its printer reliability in large part to its "stored energy" printheads. "What that means," says Perrusio, "is that our printers work basically in reverse of other impact printers. Instead of charging the solenoids whenever a given pin has to fire, we keep the solenoids energized all the time and, to print, reduce the power, creating a spring velocity effect. This saves wear and tear on the printhead, and it's much less noisy."

Most of the Seikosha respondents we have contacted do not know about stored energy printheads; all they know is their printers are the among most satisfactory they have ever encountered. Typical of Seikosha respondents, Tony Kyritsis of Ft. Lauderdale, Florida, says his Seikosha printer "is extremely good. I'm very happy with it."

HUMAN TECH SUPPORT

Seikosha services its products at its corporate repair facility in Mahwah, New Jersey, as well as at a number of independent service providers (mostly authorized dealers) and a single third-party servicer, Dow Jones Inc. (not related to the Wall Street firm). According to Perrusio, this totals about 250 authorized Seikosha service centers nationwide.

Tech support is handled by an in-house 800 number that lets you talk to a human being almost immediately. At present, there is no technical-support bulletin board service, but Richard Kurtzman, Seikosha's manager of technical marketing services, says he's hard at work on one.

Mr. Kyritsis, who had to call Seikosha tech support only once, has this to say of his printer problem: "They were very polite, walked me through everything, and had it up and running in under 15 minutes. They were great." We here at PC Magazine agree wholeheartedly. After languishing on hold for hours at larger, better-known printer companies, it was a little surprising to hear a human voice answer the very first call.

LOW BUY-AGAIN NUMBERS

Only 68 percent of our Seikosha-using respondents say they will buy again from

PRINTERS

Star Micronics America Inc.

by Joseph J. Antinori

COMPANY SCORES



420 Lexington Ave., #2702
New York, NY 10170
(212) 986-6770 (sales)
(714) 768-3192 (technical support)

▼ Actual score ▲ Average score □ High-low range

Star Micronics recently celebrated the production of its 5 millionth printer at its plant in Shizuoka, Japan—a figure that places them second only to Epson among all printer manufacturers. This testimonial to Star's popularity is proof of the "versatility, reliability, and excellent value of Star printers over the past 19 years," says Mickey Yamaguchi, president of Star Micronics America. Most of those 5 million machines are low-end, dot matrix units.

In 1982 Star Micronics introduced the Gemini-10, a 9-pin dot matrix printer that set a new price/performance standard and sold like hotcakes until Star discontinued it in favor of their currently bestselling NX-1000 line. Another very popular model, and one which garnered *PC Magazine's* Editor's Choice award in the November 14, 1989, issue, has been the XB-2415 Multi-Font, a 24-pin machine with 16 resident fonts and "super-letter qual-

ity" capability—options that have distinguished it from its competition in a crowded field. Star introduced the Laser Printer 8 in late 1987, but laser printer sales account for only a fraction of Star's business.

Low prices have been the hallmark of the Star name from the beginning. Bearing that in mind, one might expect to find that Star's machines have been somewhat less than exemplary in their quality, or that the company doesn't leave much in the budget for service and support. Not exactly so, according to survey respondents with first-hand experience.

Our relatively large sample of Star users give the company an overall reliability rating of 92, exactly the average for printers as a whole. More impressive, though, is the problem-incidence percentage. Of Star users, 17 percent have experienced problems of any kind, 2 percent lower than the average for all printer makes and models. And our results show that when there is a problem, it is more likely to be minor than printer life-threatening. Bear in mind that these are low-end, 9- and 24-pin dot matrix printers by and large, and Star's performance looks more and more impressive.

Respondents register the usual spectrum of complaints ranging from print-head pin breakages and paper-feed difficulties to displeasure with the speed or loudness of the unit. No single problem occurs with any noticeable frequency.

REPAIR AND TECH SUPPORT

Star offers a one-year warranty on all of its printers for parts and labor, covering any defects in material and workmanship. Except for special contracts in cases of large-volume orders, service issues and repairs are handled by the over 1,000 authorized Star service centers in the U.S. and Canada. According to Brian Malhiot at Star Micronics Research Laboratories in Santa Ana, California, most Star users drop their machines off for repair in person, though Star will mirror ship them if the end user is out of range.

Some retailers are also authorized service representatives, having undergone a three-day Star tutorial and submitted to an inspection of their workshop. But most service is performed at Xerox service locations. The respondents in our survey are generally pleased with the repair service they have received from the centers, though they are less generous in their appraisal of the manufacturer's admittedly few repairs.

It appears that our respondents' dissat-

the company—surprising in light of Seikosha's product quality and customer support, but not so surprising if we take into account the nature of Seikosha's product and the needs of its customers.

Seikosha printers are generally high-end impact printers. The price of the high-end models, as noted in previous *PC Magazine* reviews, has always reflected the corporate orientation of the units' intended buyers. These same customers, if they're shopping for new units, are probably not in the market for an impact printer anymore. High-end laser printers are the current business machine of choice, and Seikosha doesn't make one.

"We chose the high-end impact market because that's the way the market was moving," says Wayne George, a public relations executive at Seikosha, when queried on Seikosha's customer loyalty. "The low-end dot matrix market just wasn't profitable over the last few years, and the low-end laser market is much too crowded right now for us to want to invest the time or money. If we do make a laser, it's going to be of the high-tech, 22- to 25-page-per-minute variety."

DISTRIBUTION WOES

"Another reason for your numbers might be that we're hard to reach," he continues. "Since we're still mainly OEM and don't appear on the regular store shelf, a lot of users may not know where to find us." So why not distribute more effectively? Few people outside the computer reseller's market have ever heard of the company even though it's been marketing printers under its own name for close to four years. Why the lack of fame for a product this good?

"It's a slow transformation," says George. "Five years ago, if you had said Seikosha, someone across the room would

"Five years ago, if you had said Seikosha, someone across the room would have yelled 'Bless you!' Name recognition is a problem."

have yelled 'Bless you!' Name recognition is a problem. We're in the slow process of changing from a manufacturing-oriented company to a marketing-oriented one. But now we're ready to grow. We're going to have some neat things happening in the next 12 months."

CIRCLE 644 ON READER SERVICE CARD

ity" capability—options that have distinguished it from its competition in a crowded field. Star introduced the Laser Printer 8 in late 1987, but laser printer sales account for only a fraction of Star's business.

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PRINTERS

isfaction in their direct dealings with the manufacturer stems from the technical-support hot line. Between 28 and 37 percent of users of different Star models are unaware that a support line exists, and of the 10 percent who have actually called the number, dissatisfaction is higher than average. Technical-support representative Malhiot explains that Star originally had a 900 number, charging callers on a per-minute basis, and then abandoned that system in favor of the current number, (714) 768-3192. There are no plans for an 800 number for end users.

80 percent of those polled say they'll buy from Star again; this is 3 percent less than the average. The difference may be accounted for by the average age of Star's installed base. 3 percent more than the average say the machine no longer meets their needs. Indeed, you might be ready to upgrade too if you'd used a 9-pin dot matrix printer for 5 or 6 years.

CIRCLE 645 ON READER SERVICE CARD

Tandy Corp.

by Cristina Cordova

COMPANY SCORES



700 One Tandy Dr.
Fort Worth, TX 76102
(817) 390-3011
(817) 390-3861 (technical support)

Legend: Actual score (blue square), Average score (orange triangle), High-low range (white box)

Tandy acquired Radio Shack in 1963 and in 1979 rolled its first computer, the TRS-80, off the production lines. Since then Tandy has produced a variety of computers, printers, and peripherals, all marketed and serviced via the company's Radio Shack stores.

Tandy printers finish in the middle of the pack in terms of their reliability rating, showing a slightly lower-than-average percentage of problem incidence and near-average numbers when it comes to tech support, but lower-than-average repair service satisfaction. Given this reasonably strong performance, we're surprised that Tandy comes in dead last on the question of whether survey respondents will buy from Tandy again.

SOLID RELIABILITY, FEW PROBLEMS

PC Magazine's reader survey shows that Tandy's overall reliability rating is 91, 1 point lower than the overall average for printers. Those of our survey respondents who use a Tandy dot matrix printer have experienced 5 percent fewer problems than the overall average of 17 percent. Those using the DMP-130 note an 11 percent problem incidence—6 percentage points below average.

15 percent of those who need technical support contact Tandy directly—5 percent above the average for all printer respondents; and 13 percent have contacted their Radio Shack retailer—7 percentage points above the average. Both groups' satisfaction levels are above average.

Of the respondents who have used a repair service, 8 percent have gone to their retailer—twice the average for all printers—and about 9 percent went to the manufacturer—4 percentage points above average. Satisfaction with these sources is just slightly above the overall printer averages of 64 and 66 for manufacturer and retailer repair service, respectively.

ODD CONTRAST

In contrast to these relatively strong numbers is the surprising fact that only 63 percent of Tandy printer users responding to our survey say they will buy from Tandy again, 20 percent below the average for all printer manufacturers.

Our research points in a number of different directions for explanations to these problems. For example, although Radio Shack retailers score about average in both support and service, not all of our respondents are happy with the treatment they have received at their local store. Some respondents complain about Radio Shack employees' lack of knowledge. J.E. Hollowell, of Folly Beach, South Carolina, writes, "I bought a Tandy because of advertised support, but found out all I could talk to were sales persons with very limited knowledge."

However, not everyone is unhappy: "It's comforting to know that when the equipment malfunctions I'll have someplace to take it, and I can talk in person to the repair technician instead of boxing up my machine, entrusting it to the postal service, and sending it off to some distant repair center," says Rick Perry, assistant systems manager of Tucker & Associates in Benicia, California. "Contrary to popu-

Tandy Corp.

Tandy Dot Matrix



Tandy DMP-130



lar opinion, the personnel at Radio Shack computer centers are very kind, helpful, and knowledgeable."

It is apparent from the comments we have received that the knowledge and service level of Radio Shack employees seems to vary widely from store to store. This is a sentiment that is echoed by Collin Meyers, a buyer for Tandy Corp. "It may not be as easy to find someone who knows a lot about computers in a store that sells stereos as it would be in a specialized computer store. That's why we get so many complaints about Radio Shack," says Meyers.

COMPATIBILITY WOES

Another reason for buyer resistance to choosing Tandy again is voiced by David R. Price, a foreman for the Washington Gas Light Co. in Rockville, Maryland. "Tandy's problem is its nonstandard printer parts," says Price.

According to Tandy's Meyers, steps have been taken to improve this problem. "In the last three to four years, we've changed over to standard MS-DOS type emulations. The original printers didn't have these emulations, so they don't work with the software that is now available. And we've recently switched over to using standard IBM-type ports. It used to be that when you bought a Tandy printer you had to buy a Tandy cable, but this is no longer true."

DISILLUSIONED USERS

Finally, another possibility for Tandy's low buy-again percentage may stem from the fact that 12 percent of the Tandy printer users among our respondents feel that the printer does not live up to their expectations, compared to an average of 6

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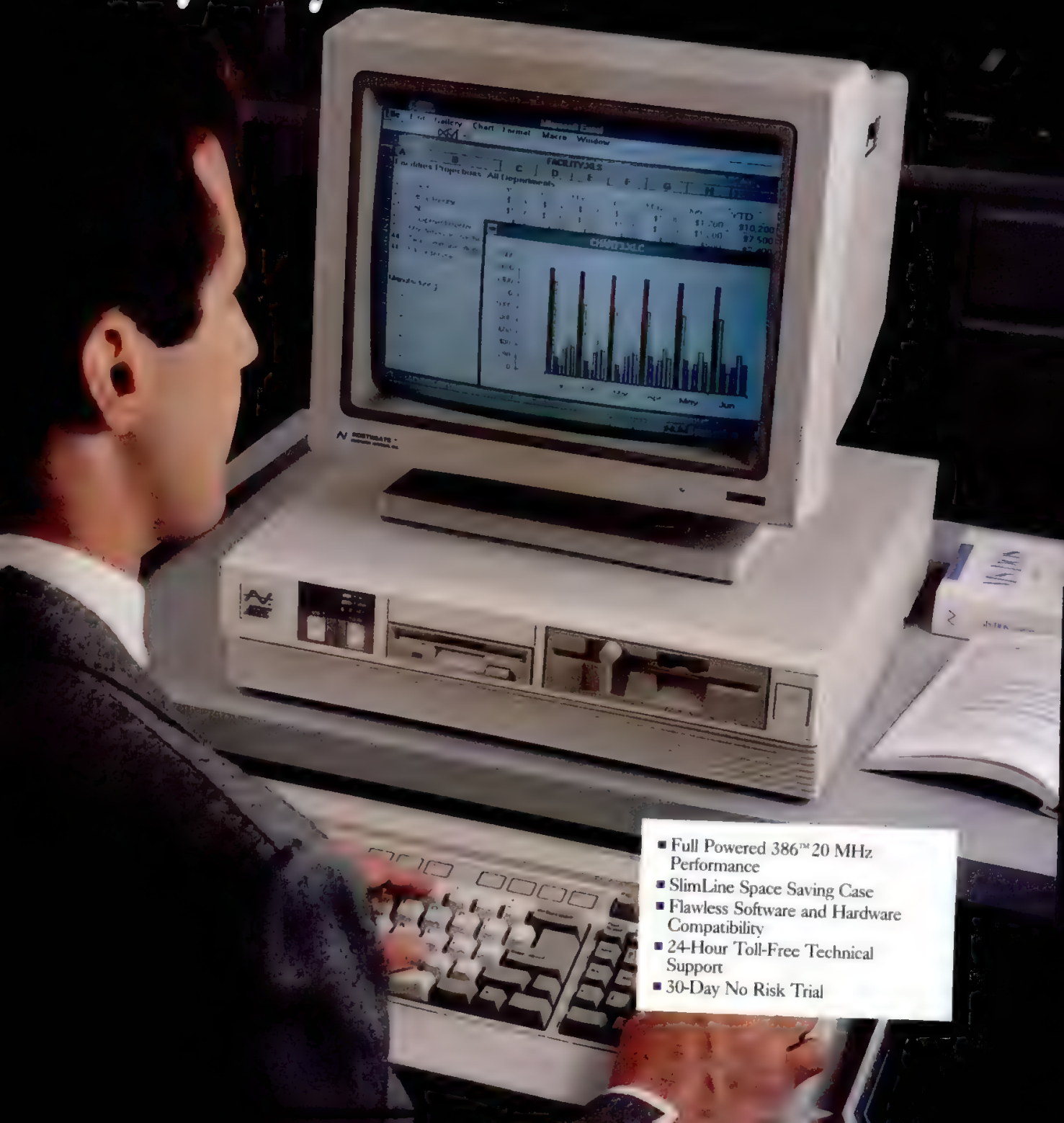
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PC Magazine said: "(SlimLine) doesn't take up a lot of room ... but it delivers plenty of computer for a price you might expect to pay for a 286 system."

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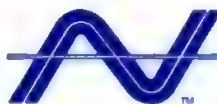
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PRINTERS

percent for all printers included in our survey. Even though these respondents have used their Tandy printers for seven months longer than the 30-month mean length of ownership (the model DMP-130 has been owned for a mean length of 10 months longer than average), the percentage of persons whose printers do not live up to their expectations is noticeably higher than average.

Only 72 percent of the Tandy printer respondents feel that their printers meet their needs against an overall printer average of 83 percent; and of the respondents who use a DMP-130, the percentage is only 69 percent—14 percent lower than average.

As Tandy adds to its printer line with more IBM port- and emulation-compatible machines, we may very well see these numbers rise.

CIRCLE 646 ON READER SERVICE CARD

Toshiba America Information Systems Inc.

by Oliver Rist

COMPANY SCORES



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(800) 999-4273 (technical support)

Legend: Actual score (dark bar), Average score (light bar), High-low range (white bar)

On April 1 of this year, Toshiba America Information Systems underwent a major expansion. Products were separated by type, and responsibility for them was divided into seven new corporate groups, including a team called Toshiba Printer Products. As the name implies, this group produces Toshiba's full line of printers, including laser, dot matrix, and portable models.

What that means is that Toshiba's products come from a corporate structure with vast resources that ought to handle tech-support and service with ease. Not according to the Toshiba respondents on our survey!

LOW NUMBERS

Toshiba scores consistently below average on almost all questions regarding service satisfaction, tech support, and customer loyalty. These indications are not lost on Toshiba. According to Chuck Mitchell, a senior product manager at Toshiba Printer Products, the company has been and still is planning and implementing improvements in its customer service network.

Of greater concern regarding Toshiba's performance in our survey is its overall reliability rating of 80, compared with the average of 92 for all printers. A whopping 45 percent of our respondents who cite problems with their Toshiba printers—compared with an average overall problem incidence of 19 percent—reinforce this finding.

Difficulties noted by our respondents range from paper jams to compatibility problems. One problem that cropped up was a 6 percent printhead failure incidence (the overall average is only 1 percent). Toshiba's Mitchell acknowledges this defect and told us that Toshiba has in fact switched printhead manufacturers: Toshiba now uses TEC (Tokyo Electric Co.) printheads.

Not surprisingly, only 69 percent of our respondents say that they will buy another printer from Toshiba, compared to 83 percent for the overall average. Mitchell, who specializes in Toshiba's dot matrix products, along with Rono Mathison, his counterpart for laser printers, cite the company's growing concern with customer satisfaction. "We've made the company realize that printers are different from other computer products," says Mitchell. "We're going to be building strongly here over the next few months."

REPAIR AND TECH SUPPORT

Repair service and tech support ratings are also below average, according to our survey respondents. Toshiba's repair service is rated "highly satisfactory" by only 62 percent of its printer customers, while 72 percent of all printer survey respondents rate their companies' repair facilities as such. Individual experiences seem to back up this number.

Says John Behn, a computer consultant based in Wilmette, Illinois, "When I called in about the problem my unit had with proportional spacing, the rep kept

Toshiba America Inc.

Toshiba Dot Matrix



Toshiba P321SL



Legend: Actual score (dark bar), Average score (light bar), High-low range (white bar)

babbling about using a different font. Although they did send me a useful technical manual so I could write the drivers myself, they really should do more work."

In keeping with Toshiba's recognition of its service and support problems, things are changing. The new Printer Products Division's tech support staff employs seven full-time and two part-time technicians and can be reached at an 800 number or via a computer bulletin board. The bulletin board does not have an 800 number but is otherwise free and runs 24 hours a day. Questions coming in after business hours won't be answered until the following morning but, during business hours, claims Hugh Faulkner, a product support supervisor, the response time averages only 20 minutes.

Toshiba publishes its own consumer support magazine, *Microlife*, available to buyers of Toshiba computer products. It deals primarily with Toshiba's laptops but has detailed instructions on the proper use of the tech-support system—and even a letters section where technical problems can be addressed in subsequent issues.

"Right now we deal mainly with hardware introductions and consumer problems," says Cassandra Cavanah, *Microlife*'s editor. "But we plan to expand to software reviews and other things that make life better for the Toshiba computer products customer."

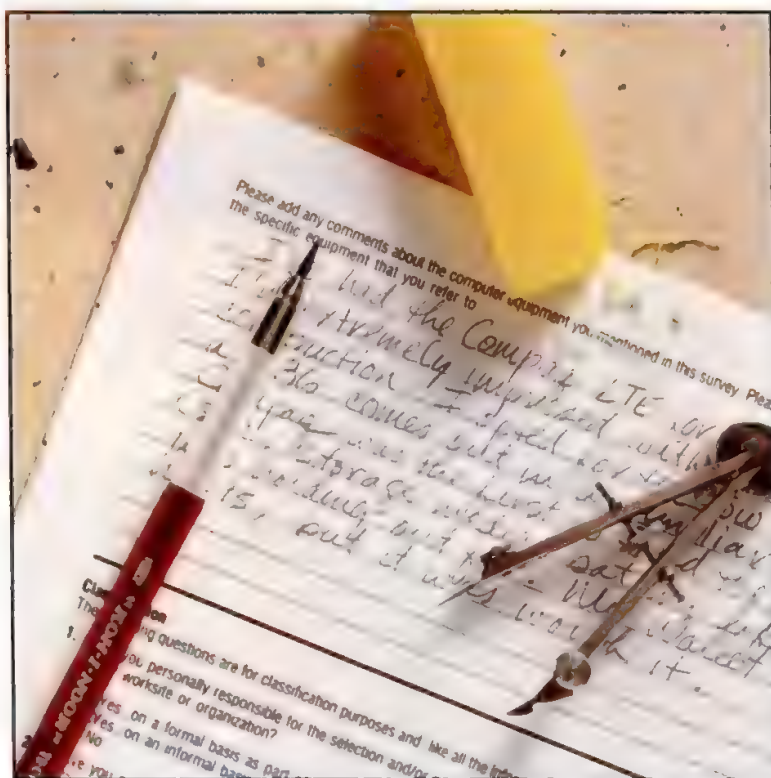
Toshiba's reliability, support, and service haven't been up to par. But they are hardly at the bottom of the list, and Toshiba seems to be making an energetic effort to improve. It will be interesting to see how this new commitment reflects itself in customers' opinions in the next service and reliability poll.

CIRCLE 647 ON READER SERVICE CARD



COVER STORY

Perhaps more than any other type of computer equipment, portables take a beating. They're regularly stored under airplane seats during turbulent transcontinental flights, driven over pothole-scarred streets of major cities, and asked to withstand the rigors of a day out in the field—sometimes literally. All things considered, it seems a wonder that any portable, whether of notebook, laptop, clamshell, or lunchbox design, manages to survive and even thrive for years at a time.



PHOTOGRAPH: PETER NEUMANN

PORTABLES

LONG-DISTANCE RUNNERS?

True, our survey shows that portables don't have the highest reliability ranking of all the categories, but they do score a solid 87 out of a possible 100. That's not too shabby, particularly when you consider that the average age of these portable systems is nearly two years. And although portables have the second-high-

P

BY
JENNIFER
ZAINO

portables don't have it easy. Our respondents have taken them on trips, across the world, and even on the New York subway system. In the light of their travel schedule, it's encouraging to find they're as reliable as they are.

PORTABLE PCs

est percentage of overall problem incidences, the dubious honor of first place belongs to desktop personal computers, which are less likely to be moved, tossed, and rattled.

THE LOWDOWN ON THE BREAKDOWN

Of the 18,000-plus people responding to the survey, 4,087 indicate that they own a portable. We arranged the responses according to three classes: 8086/8088 port-

machine is more primitive than a 386 or 386SX is still living in the Stone Age. But in the portables arena, our respondents report that machines using 8086/8088 processors still get the job done. Not only do far more users report using these systems, but these are deemed a tad more reliable than their speedier 286 and 386/386SX counterparts. That's impressive if

In the portables arena, our respondents report that machines using 8086/8088 processors still get the job done.

ables (along with machines using the comparable NEC V20, V30, and V40 processors), 80286 systems, and 80386/386SX models. Some of the best-known portable manufacturers—Compaq, IBM, NEC, Sharp, Tandy, Toshiba, and Zenith—boast enough responses for us to draw significant conclusions regarding these companies, and often regarding specific products or product lines.

While fewer than 75 respondents indicate that they use systems from companies like Datavue, Epson, GRiD Systems, Kaypro, or Mitsubishi, the name recognition these companies have (and not always for the best of reasons) makes it worthwhile for us to include detailed analyses of them. Remember, though, that in these instances we can't predict valid patterns but can only tell you the experiences and thoughts of our small base of respondents.

Additionally, wherever we have under 30 responses for a given company, the sampling is really too small for a valid analysis, so you'll find that some well-known names like Dolch, Mitsuba, and PC Brand are missing here. Hewlett-Packard, with 47 respondents, is also missing: though it still offers support for its portable products, it discontinued that line over a year and a half ago. HP portable users may be comforted to note, however, that the respondents we have heard from give the company very high marks for its portables' reliability.

DIFFERENT FROM DESKTOPS

As we have learned, users don't think there is any such thing as a dead lobster when it comes to portables. In today's business world, anyone whose desktop

you consider that, unsurprisingly, they have been used 8 to 11 months longer than the average 286 or 386/386SX. While respondents may sometimes wish for more-powerful systems, for many nothing has come along with enough of the right features—low weight and long battery life—to replace their old standbys.

Curiously, despite the 8086/8088 machines' broad appeal, users of 386/386SX systems lead the way in reporting that they would buy from the same manufacturers again. While 79 percent of 8086/8088 users and 81 percent of 286 owners respond yes to this question, a full 84 percent of 386/386SX users would not hesitate before making out a check for another product from the same company. Apparently, the last group's characteristically greater speed, better video capabilities, and higher hard disk capacities make an impression that is most likely to keep users coming back for more.

And what about 286-based portables? On the average, we find, they are shared among three users, compared with the two users who generally share an 8086/8088 or 386/386SX system. While they tie with 386 and SX machines in terms of reliability, the 286s do have a greater overall problem incidence than either of the other categories.

SPEAKING OF PROBLEMS

Problems for 8086/8088- and 286-based machines are rated as less severe than the problems that occur in 386/386SX-based systems. But as with any electronic equipment, any number of things can go wrong with your portable system, no matter what processor it uses. Since you'll probably be moving your machine around a lot,

you should be prepared for both minor and major disasters—anything from a hard disk crashing to a floppy disk drive getting thrown out of alignment to a battery losing some of the kick it used to have. You'll find useful information on how to combat or even avoid these troubles in the sidebar "Portable Perils: Time, Space, and Gravity."

In our survey, 61 percent of our respondents have experienced no problems; the others generally deem the most serious to be screen-related occurrences. While displays are one of the more delicate components, prey to fading from heat and prone to developing bad bits in the video memory chips, batteries and hard disks tie for second place in the problem department. Yet the small percentage of respondents reporting that they had any problems at all indicates how far the industry has come in improving shock-mounting techniques and in making portables and their accessories more durable.

WHEN THINGS GO WRONG

Our survey shows that users usually turn either to the manufacturer or to their retailer for technical support—which essentially means for advice—and to either of these sources or to their own wits for repair jobs. In our respondents' eyes, some manufacturers and retailers ought to spiff up their tech support services a bit. The average level of satisfaction with manufacturers' tech support is only 57 out of a possible 100 points (where 100 means very satisfied); overall satisfaction with retailer tech support is 58.

Of course, some provide better tech support than others; the leaders include Epson and Sharp retailers, Datavue, GRiD Systems, and even IBM (via direct service contracts and possibly through sources like IBM Service Centers or the now-defunct IBM Product Centers). But our respondents also think that, among others, IBM retailers, Mitsubishi retailers, and Sharp itself don't do as well as they should in providing tech support.

As for repair services, outstanding performers include GRiD Systems and IBM, while users suggest that both Mitsubishi and its retailers, NEC's retailers, and Zenith Data Systems, among others, ought to polish their act. Compaq's low ratings are not surprising, as it doesn't offer any service directly—not even to large corporate accounts. Respondents who have been able to perform repairs themselves seem happiest, giving them-

PORTABLE PCs

selves an 82 score for satisfaction with their own handiwork.

Note that in most cases the users have had no extraordinary problems with their machines. Rather, the respondents' wide-ranging complaints indicate that add-on items are too expensive, or that the companies have failed to let customers know about upgrades, or that even satisfied users live in dread of anything going wrong, based on what they have seen of retailers. Some of the strongest comments center around manufacturers such as Sharp who have not only discontinued an item but discontinued their support of it. Even

when a model like the IBM Convertible is still officially supported, users have had long waits to get the equipment they need. (In this instance, IBM does make supplies available but admits that since the machines have been discontinued, getting equipment to dealers could be more difficult.)

THE SATISFIED

Who among the companies represented here wins the hearts and minds of its users the most? Toshiba, with an overwhelming

total of 1,076 responses, seems to hold the cards: 87 percent of the users we've heard from say they would purchase a system from the company again, and that's a good 10 percentage points above the average. T1000 users are a particularly contented lot, with 89 percent reporting that they would buy from Toshiba again. The company's overall reliability rating is a generous 90, and again the T1000—a perennial favorite—wins big, with a reliability score of 94.

As for Compaq, almost everyone has probably sat through some sort of presentation presided over by one of the models

HEAD TO HEAD: COMPANIES COMPETE ON SERVICE AND RELIABILITY

Out of the twelve companies included in our survey of portable computer manufacturers, seven had the requisite 75 or more responses from which we could draw valid conclusions. The results show that Toshiba takes the lead in satisfying user expectations sufficiently that they would buy from the company again. Its systems are just edged out by Tandy in terms of reliability, but apparently people want something more than a machine that merely avoids causing problems; Tandy doesn't come anywhere near Toshiba on the "buy again" scale. For quality of technical support, Toshiba again takes the lead in meeting users' needs.

Toshiba's strong showings in the "buy again," reliability, and technical support areas are even more impressive when you consider that it leads the competition by far in the number of respondents who report using its products: 1,027. Its closest runner-up is Zenith, with 683 respondents claiming that they use the company's systems.

Compaq, whose line of Portables have long been a fixture at product presentations across the country, also does well in terms of buyer loyalty, with 83 percent of its users saying that they would buy from the company again. Its generally higher-priced systems also garner high scores for reliability, backing up the old adage that you do get what you pay for.

IBM and Sharp form a pair in two out of the four contests, scoring identical marks for reliability and repeat purchases. They also link up closely when it comes to repairs, although Big Blue takes first prize in this instance.

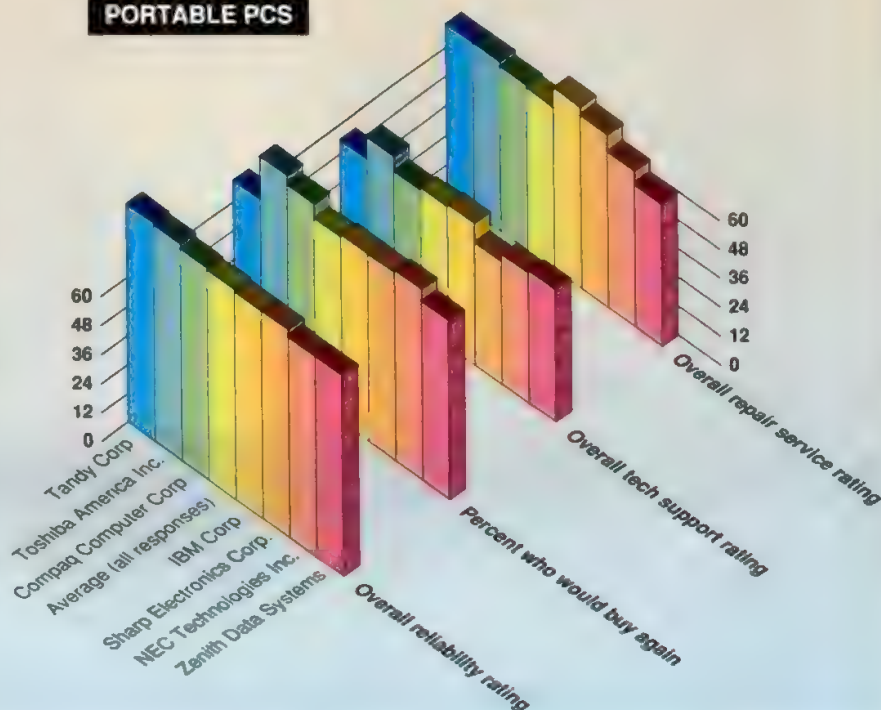
NEC hovers near the top in only one respect, but an important one: the percentage of users who would buy from the same company again. As for Zenith, its large number of users are not necessarily the happiest: the company ties with NEC for bottom scores in reliability, takes second-to-last place for the percentage of users who would buy one again, and comes in dead last for repair satisfaction.

PORTABLE PCS

This 3-D bar chart gives you the chance to compare at a glance the company scores for four questions:

- How would you rate the product for overall reliability?
- Would you buy a product from the same manufacturer again?
- How satisfied were you with the technical support you received?
- How satisfied were you with the repair service you received?

The first question and the last two call on respondents to give a rated response based on a scale of 1 to 5, which we converted to a more familiar 1 to 100. For the second question, though, each result indicates the percentage of respondents who answer yes. Note that answers to the first two questions come from all those responding for a given company. For the last two questions, however, those answering are a subset of the total respondents—only those persons who tried tech support or had a repair problem.



in the imposing Portable line. It takes second place, with 83 percent of the users reporting that they would buy from the company again. In the realm of manufacturers with small user bases, Epson boasts an 80 percent score for the number who would buy from the company again.

The detailed analyses that follow will clue you in on what to expect not only from the systems but from the companies themselves, particularly in the area of service and support. Along with the lamentations of users whose hopes for a happy coexistence with their portables were dashed to the ground, you will find the ecstatic exclamations of those who have made near-perfect matches with the luggables of their choice. Respondents write in with awe and appreciation of systems that have survived drops to the floor, trips across the world, being struck by lightning (admittedly, there was some damage to that particular machine, but it was quickly repaired), and—perhaps worst of all—rides on the New York City subway system. And others are simply impressed by the faithful performance of an old companion: maybe not the computer version of a Rolex with all the fancy trimmings, but just a simple Timex that keeps on ticking.

Of course, any and all of the respondents might still be interested in the ultimate portable—you know, a battery-operated 386 complete with a color VGA screen and weighing under 5 pounds. If the companies that have user loyalty now know what's good for them, they'll be working hard to develop it.

Compaq Computer Corp.

by Matthew J. Ross

COMPANY SCORES

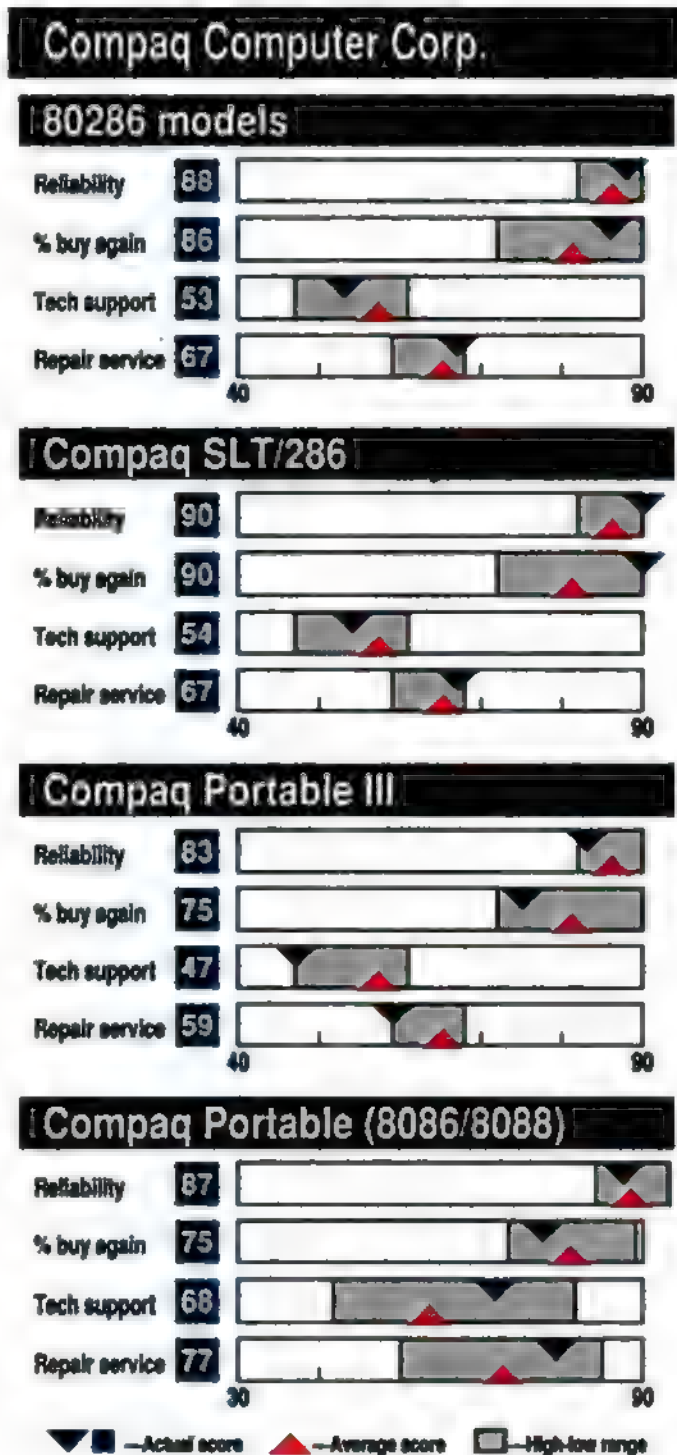


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SERVICE AND RELIABILITY PORTABLE PCs

According to Compaq Computer Corp., "Service and support are the key to success in the nineties." For a company that relies totally on dealers to sell its product line, Compaq works hard to



listen to its channel and to educate it.

Compaq takes an indirect approach to customer service, with all end-user contact coming through the company's authorized dealers. Becoming an authorized Compaq dealer is no easy task. Retailers must submit a business plan and demonstrate financial viability before being considered. They must also each carry at least one full-time salesman plus a technician dedicated to Compaq products. Sales training requires a full day of classes that Compaq provides, while the technical service classes run three days. Additionally, Compaq requires supplemental training when it adds new products to its line.

Compaq sees the service aspect of the personal computer industry as a high-profit business, which it does not want to take away from its dealers. "In our

multivendor environment, dealers are the best able to assist end users in choosing an appropriate hardware/software business solution and then supporting the users and the products they selected," says a Compaq representative.

To help dealers, Compaq continually monitors its channel, and it has quarterly reviews to address its retailers' needs. Compaq provides a direct hot line to let dealers contact the manufacturer on tough technical questions, so the dealer can quickly respond to users' calls for support. A dealer who requires more help can set up a conference call with Compaq and the user.

To make matters easier for those retailers, Compaq has lessened the number of replacement parts they are required to keep in stock, while providing financing to dealers through five finance companies. If a customer wants to place a large order, first the dealer must purchase the equipment from Compaq. The financing ensures that Compaq dealers won't be frustrated in a major sales effort because of cash flow problems.

This indirect support approach does not seem to offer any major benefits or disadvantages, with the exception of some hard feelings toward Compaq when a customer wants to speak to the person in charge. In our survey, an engineer involved with federal defense contracting in York, Pennsylvania, expresses displeasure that he could not speak to anyone at Compaq. After installing Intel's Above Board, he discovered that Intel's print spooler and the Compaq disk cache utility that came with his Portable II were not compatible. He had bought the card from a third party, so his Compaq dealer wasn't eager to help. While Intel didn't provide much help either, at least he was able to speak to someone there.

WHAT KIND OF A DEAL?

Servicewise, Compaq is as good as the local dealer in your neighborhood—but this presents a problem for some loyal Compaq users. Dick Farrell, a banker from Mankato, Michigan, has worked with a Compaq Portable, then a Portable II, and he now owns a Compaq LTE/286. Farrell says, "I've had very minor problems, which my local dealer has fixed quickly." Unfortunately the Mankato dealership eventually closed, leaving Farrell 90 miles from the closest authorized Compaq dealer.

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Toshiba America Information Systems Inc., Computer Systems Division

PORTABLE PCs

company, there will be some geographical gaps. Compaq does a relatively good job of covering the country, however, with over 3,000 dealers worldwide and 1,700 within the continental United States and Canada.

Not surprisingly (since Compaq does not offer technical support itself), our 627 survey respondents who use Compaq portables give the company a rather low 41 satisfaction rating for technical support supplied directly by the manufacturer, compared with a 57 rating from all

respondents who use laptops. Yet our survey indicates that Compaq users are as satisfied with the overall technical support and repair service they've received as all portable users are.

PORTABLE AND PORTABLE II

Compaq's reliability also fares well among our respondents. Compaq's 8088-based Portable and Portable II line has been by far the longest in use, with Portables aver-

aging 53 months of use, compared with an overall survey average of 20 months.

Craig Reynolds, who owns a construction company in Oceanside, California, has owned his Portable II for more than two years, with only one minor problem: the floppy disk drive no longer ejects disks. "I throw my Compaq in the back of my truck," he says. "It bounces around and takes a lot of abuse, but it always works."

Reynolds's experience with his dealer has been minimal, but he did receive some



PORTABLE PERILS: Time, Space, and Gravity

by Bill O'Brien

Advances in surface-mount technology, chip integration, and low-power design techniques were responsible for making portable computers viable products—small enough to carry around yet practically as functional as their full-size counterparts. Unfortunately, there are some less concrete aspects of portable computing that technology just can't address; time, gravity, and sprints through airport corridors all conspire to transform your working luggable into a useless mass of hardware.

No matter what type of portable you own, the weakest links in the system are the mechanical components. Although most portables use shock-mounting systems for their disk drives,

trip to the service department.

Likewise, when you begin to hear a raspy whirring noise from your hard disk, credit yourself with having rattled loose the drive brake, which is now rubbing against the disk's hub. Functionally, the disk may survive for quite a while, but you'll need to run CHKDSK more frequently, and you'll probably meet with an increased number of access errors when trying to read or write data. This time, it's the shop for sure, because there are no user-serviceable components in a hard disk.

If your portable doesn't automatically park the hard disk's read/write head, do it yourself before you move the system. Even if your drive is shock-mounted, you run the risk of crashing the head into the disk media if you're

when the system has been left to stand stationary at the repair facility, don't assume the presence of computer grem-lins. Most lunchboxes use full-size componentry stuffed into a small enclosure; the constant movement of the system as you carry it stresses the case and everything inside. An I/O card that has inched itself out of its slot as the case was shifting back and forth while traveling may be at fault.

Peel back the cover and take a look at the installed boards. You may see one or more of them that look tilted, or you might even see the gold sides of the edge connectors sticking slightly out of the bus connector. Remove the screws that hold the cards to the rear panel and gently reseat the boards as needed. While this will most often solve the problem, it is possible that a card was dislodged so severely that it caused an electrical short, which means major surgery for either the board or the computer itself. To minimize the danger of such a problem, it's wise to check all the boards in your system periodically, whether you suspect trouble or not.

You can't completely foolproof your portable any more than you can totally burglarproof your home, but you can minimize problems by exercising preventive care and taking appropriate steps when damage occurs.

a good whack on a door jamb, a careless toss into the car, or even a short drop to the ground can jar the life out of the drives. If your computer no longer reads floppy disks created on other machines and vice versa, you've probably thrown the read/write head out of alignment. If you have an alignment diskette and an oscilloscope, you can make the repairs yourself, but more often than not the situation calls for a

toting the machine around when the head isn't parked—and there's no repair for that. The hard disk valet program you'll need can be found on almost any disk utility. Indeed, where parking isn't an automatic feature, many portable manufacturers supply their own parking programs.

If you own a lunchbox-style portable and experience random freezes or glitches, but there's never a problem

A CHARGED-UP ISSUE

Laptop and clamshell owners are more fortunate, in that the option connectors in their machines are specifically designed not only to accept add-in boards and devices but also to hold them firmly in place (possibly that's because it's difficult to pry your way inside these most diminutive of computers). To compensate for this good luck, they are saddled with batteries. Modern-day rechargeable nickel cadmium batteries

PORTABLE PCs

help selecting a video card to drive an external monitor. "The dealer did his job," Reynolds remarks.

PORTABLE III

In his survey response, Paul B. Hill of Norwood, Massachusetts, reports good success with his Compaq Portable III, saying, "It has held up well considering the number of times it's been dropped or banged into a door frame." In a more recent interview, however, Hill complains that the unit now needs to be hit on the

side to get it to work any time it has been moved. Hill says that friends have been luckier with Compaq Deskpros, but the Portable III has proved to be a machine that can't last more than three years.

Hill is now left with mixed feelings about Compaq. His original Compaq dealer at Entre Computers provided walk-in repair service and was prompt in contacting Compaq on any technical problems he could not answer. When that

can have a life span of up to 1,000 charges; during normal use, that can equate to nearly three years of faithful service. But poor charging habits, like leaving the charger connected beyond the manufacturer's recommended charge time, can shorten that life considerably.

Naturally, if you've been following the correct charging procedure and you begin to notice reduced run times, it may mean that your battery is about to expire. It may also mean that your portable is no longer implementing its power conversion routines (screen blanking, halted disk rotation, and so on). If these are settable parameters, check to see that they are still on. If all seems well on that front, try popping in a new battery. If that doesn't work, it's probably time to send your unit in for repair. You shouldn't rule out the charging circuitry as a factor here; if the charger is not an integral part of the computer, always include it when returning the machine for service.

In catering to the fast pace of the portable crowd, manufacturers have supplied some systems with chargers that peak the power of your batteries in a few hours rather than in the more typical 10- to 14-hour time span of trickle-type chargers. While you will get back into operation faster, the higher current supplied by a fast charger will shorten the computer's operating time because the batteries don't receive the deep charge they really prefer. And the greater heat generated by the fast charge rate can actually cut your battery life by a third.

Keep in mind that some portables

will not work at all if the battery is incapable of accepting a charge, even when the machine is plugged into an AC outlet. They take power from the battery, not the charger, and when the battery dies, so does your system until you replace the battery pack.

DISPLAY DILEMMAS

When it comes to screen problems, heat plays a big part. After a good working session, the typical routine is to shut the machine and close the cover. But the display surface—no matter what type it is—radiates heat; when you close the cover, you trap that heat against the screen. Let the portable sit open for ten minutes while the heat disperses. Even if you take this precaution, at some point in the life of your machine you'll probably notice that the screen has suffered discoloration or fading. After all, a screen doesn't last forever, but there is no reason to quicken its demise.

On the brighter side, should you notice straight horizontal or vertical blank lines on the screen, absolve yourself of blame for the component failure. Usually this indicates a bad bit in one of the video memory chips or a broken connection to one of the screen segments. Whatever the case, the screen will need to be replaced.

You can't avoid hardware failures altogether over the years you'll have your system. A certain number of them are par for the course, no matter what size computer you own. But with a little care and forethought, you can look forward to letting things break on their own without your help. ■

dealer left, however, service declined.

Steve Aucker, a data support specialist with the U.S. Department of Energy in Albuquerque, New Mexico, also works with Entre, one of Compaq's major national dealers. Aucker is responsible for 50 Compaq Portable IIIs as well as 23 of the original Compaq Portables. Regarding the Portable IIIs, Aucker says, "Four motherboards out of the 50 blew in the first two months, and three floppy disk controllers failed, but my experiences with Entre have been delightful. They provide almost next-day turnaround on service." The Portable IIIs did show slightly lower-than-average reliability.

SLT/286 AND PORTABLE 386

Users of the Compaq SLT/286 and Portable 386, however, give high marks for reliability. The 146 SLT users and 48 Portable 386 users responding to our survey give Compaq high marks, with 90 and 94 percent, respectively, indicating that they would purchase from Compaq again. In fact, 83 percent of all Compaq portable users who responded to our survey would buy from Compaq again, compared with 77 percent of all portable users. In the light of the large number of Compaq users who responded, the company earns a high rating for its service, support, and reliability—even if you can't talk to Compaq directly.

CIRCLE 542 ON READER SERVICE CARD

Datavue Corp.

by Lisa Reittinger

Systems from Datavue Corp. get the job done. At least, that's the impression we get from the 44 Datavue users who have responded to our survey. This admittedly small sampling gives the company ordinary ratings in most areas, and solid scores for technical support.

In our survey, about one-third of the Datavue users voice some opinion on the merits of that support. Their comments indicate that the company's healthy ratings in this area may be attributable to the quality of its technical support staff. David Satchell, an applications specialist at GTE Spacenet in Long Beach, California, writes, "General technical and upgrade information has been rapidly and intelligently given." And John Gilchrist, a senior life actuary for the California Department of Insurance in Los Angeles, agrees, not-

PORTABLE PCs

ing that Datavue's "tech support is tops."

While the company's personnel—and its policy of offering telephone tech support without charge for an unlimited time after purchase—are appealing to users, some respondents report that other support strategies are not. Michael Delugg, a New York City-based audio/PC consultant for the David Letterman television show, says, "Getting through to tech support is absurd, and it's a toll call at prime business hours only!"

A Datavue tech support representative explains, "We can't please all the people all the time, but if a person calls and all the phones are busy, we'll call back hopefully within the hour—but if not, definitely by the end of the day. The goal of each day is to make a connection with everybody who has called in, and if it requires some overtime, we'll do it."

NOT FREE FROM FAILINGS

Our survey respondents certainly have had the opportunity to evaluate the company's tech support policies: among the companies surveyed, Datavue stands out

for having a relatively high percentage of systems that have been impaired or unusable in the past twelve months. On the

The respondents tell us that Datavue not only builds reliable machines generally well equipped to meet expectations, but has also trained its technical support staff well.

positive side, respondents note that the problems they've encountered left their systems more often impaired than completely unusable. And the systems they use range from the elderly Datavue 25 to the more recent Spark and Snap entries; a higher-than-average percentage have been kicking around for about two or more years, giving them time to rack up the wear-and-tear points.

Despite the problems reported, about half the respondents give their machines

very high marks for reliability. A typical remark comes from Chuck Ball, a consultant at Compu-Staff in Bothell, Washington, who finds that his two-year-old laptop has served him well: "For me, it's

been a good machine in terms of value and price, and it has been very reliable." And Gilchrist says of his Datavue, "I've brought it through half the airports in the country and banged it around, and it's still working just fine."

More than half of the Datavue respondents report that their systems have lived up to their original expectations. Philip Crepeau, an engineer at TRW in San Diego, California, writes, "The *PC Magazine* review of laptops some two years ago enabled me to match my needs against a product. I have not regretted my decision to purchase the Datavue Spark." Not surprisingly, the percentage of people reporting that their systems have met their expectations coincides with the percentage who say they would buy from the manufacturer again.

The respondents tell us that Datavue is doing quite a few things right: besides building reliable machines generally well equipped to meet users' expectations, the company seems to have trained its technical support staff well. It looks as if Datavue could improve its tech support only by increasing the hours that it's available and adding a toll-free number. **Datavue Corp., One Meca Way, Norcross, GA 30093; (404) 564-5555.**

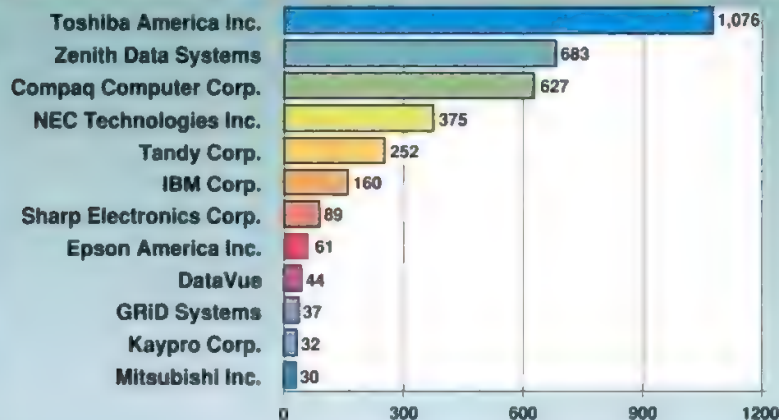
CIRCLE 543 ON READER SERVICE CARD

NUMBERS YOU CAN TRUST: HOW MUCH IS ENOUGH?

In the portable PC arena, the majority of the respondents say they have a Toshiba—not surprising, considering the enduring popularity of its T1000 laptop. Zenith (possibly with the help of its government contracts) comes in a somewhat distant second, with Compaq close on its heels.

This chart displays the number of responses each manufacturer of portable PCs received in our March 27 Service and Reliability Survey. In this issue, we review manufacturers that garnered 75 or more survey responses, the minimum number required for the results to be reliable. Where companies of special interest with fewer than 75 responses are reviewed, their ratings should be used with caution because of the small base sizes.

RESPONDENT BASE

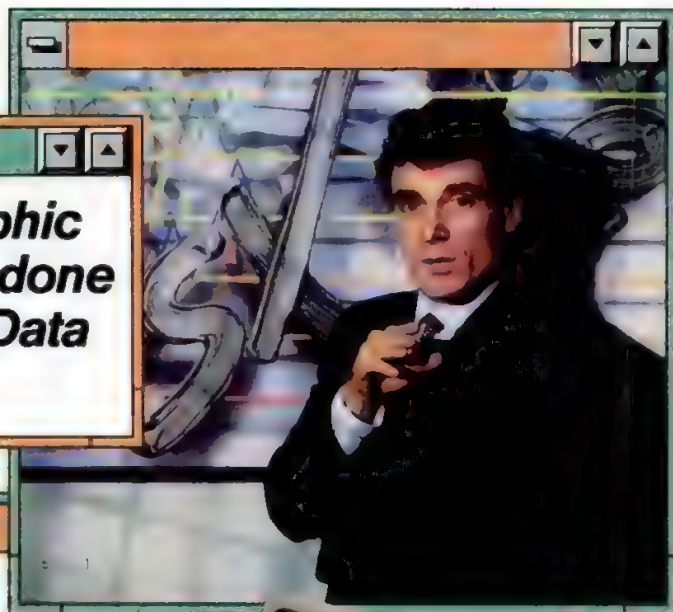
PORTABLE PC
MANUFACTURERSNUMBER OF
RESPONSES PER COMPANY

Epson America Inc.

by Jeanne Albrecht

The good news about Epson laptops, a product line that includes the NEC V-30-based Equity LT and the Equity LT-286e, is that our respondents generally consider their machines well behaved. The percentage of respondents who report problems within the past year comes in decidedly on the low side.

"I was looking for a graphic example of what could be done with a laptop PC... Zenith Data Systems showed me two."



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SupersPort 286e



SupersPort SX

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Groupe Bull

CIRCLE 732 ON READER SERVICE CARD

*Source: 1990 Dataquest estimate for U.S. battery-powered laptops. Graphics simulate Microsoft® Windows™ version 1.0, a product of Microsoft Corporation. Intel 86SX is a trademark of Intel Corporation. SupersPort is a registered trademark and Intelligent Power Management is a trademark of Zenith Data Systems Corporation.

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Note that the clear majority of the 61 Epson users we've heard from have had their machines for only 15 months or less. Not that the incidence of problems will necessarily rise as the machines age, but most of the users who have answered our questionnaire are relative newcomers to the Epson computer family.

HIGH RATINGS FOR RETAILERS

More good news: when respondents did experience problems, they generally turned to their retailers for help in troubleshooting, and our survey shows that Epson dealers have done better than average in providing technical and repair support. About one out of six users has needed technical help, and approximately one out of nine has required repair service

calculations in the field, "found the calculator keypad in the top right corner of the keyboard an invaluable asset."

PATIENCE IS CALLED FOR

Stephen Lowens, a principal engineer at Dowling Patterson Associates, a traffic and transportation research firm based in Oakland, California, knows firsthand about screen-related problems. He reports that his Epson Equity LT-286e is on its third screen in ten months. The first problem was "a string of pixels that formed a line across the screen that wouldn't go away." He mailed the defective screen back to the dealer he bought it from—and the dealer promptly mailed the same screen

the weight of the company's units. Several respondents comment that the Epson laptops are a bit of a load to lug around, especially in an age when a nicely stocked 286 portable can be found weighing about 7 pounds. Dr. Gerald S. Golden, a professor at the University of Tennessee in Memphis, also admires the keyboard on his Epson unit—the 14.2-pound Equity LT—but he now uses it mainly at home because he simply "got tired of carrying it around."

While the size of Epson machines may be irksome, a weightier question is whether users have found that their purchases have met their needs. To judge from the data we collected, the answer seems to be a resounding yes. Aside from the usually minor problems a small portion of our respondents have experienced, these machines rate as solid performers backed by good retailer-supplied repair service and technical support.

Epson America Inc., 2780 Lomita Blvd., Torrance, CA 90505; (213) 373-9511, (800) 922-8911 (sales).

CIRCLE 544 ON READER SERVICE CARD

GRiD says it is committed to providing superior support, and from our respondents' point of view, that is more than just words.

from retailers; in each case, the majority of respondents give their retailers top-flight ratings. Interestingly, Epson is one of the few portable manufacturers that provides a bulletin board service exclusively for dealers, a service that may contribute to the high ratings for retailer support. Among the users we have interviewed, only two report having had difficulty in tracking down a knowledgeable, courteous retailer. One of those two remarks that once he found a good dealer in Manhattan, he made a friend for life.

While the small base of respondents means that our data cannot define any specific trends about the company's products or services, the Epson problems we do hear most often are keyboard- or screen-related. Note, however, that in neither of these areas are the Epson scores substantially poorer than average. Although the responses pinpoint keyboard failure as the second most common problem with Epson laptops, all the respondents who volunteered a write-in comment about the keyboard make a point of noting how much they like its arrangement. Phil Mollicone, a senior geophysicist for the Van Dyke Energy Company in Houston, Texas, is not alone when he says, "The main reason I chose the Epson LT-286e over any other laptop was because I liked the keyboard layout." Mollicone, who uses the laptop mainly for data input and mathematical

back, by accident. The next time Lowens drove the screen down himself, and the dealer replaced it with a new one—which soon revealed a tendency to blank out intermittently. Lowens drove back to the dealer, and true to Murphy's Law, the screen worked perfectly while there; it wasn't replaced because, as he tells it, "they couldn't find anything wrong with it." Eventually, Lowens did make a third trip and received a third screen. This one, he says, looks like a winner.

Clearly, not everyone is overwhelmingly satisfied with dealer service. "My service problems related to the long distance between my home and the dealer," Lowens says, "and the number of trips I had to make to get the good screen. Overall, though, I'm pleased with the machine's performance, and I especially like the keyboard, which is closest to the IBM configuration that I'm used to."

Mollicone also reports that his screen blanked out intermittently, but he was able to determine the cause of his problem easily with the help of the retailer. "Since the screen is detachable," he says, "one of the connections tended to work loose over time and simply needed to be pushed back into place." His only real complaints about the system are the oversized AC/DC converter and the 17-pound weight of the machine.

He is not alone in complaining about

GRiD Systems Corp.

by Nina Barringer

GRiD Systems Corp., based in Fremont, California, seems to be doing one very important thing very well. The company says it is committed to providing its corporate clients with superior technical support, and from our survey respondents' point of view, that is more than just words. When GRiD users' responses are compared with the average satisfaction ratings for manufacturer-supplied technical support and repair services, the data shows that users heartily approve of GRiD's policies in these areas.

About one-third of the 37 GRiD respondents have had the opportunity to evaluate the company's technical support services at some point, and almost one-fourth have had occasion to turn to the manufacturer for repairs. Almost one-third of the 37 respondents—about par for the course—have experienced problems with their systems at some time.

RIGOROUS USE

GRiD Systems, founded in 1979 and acquired by Tandy Corp. in 1988, cites the nature of the environments in which its laptops are used as a possible explanation

for some instances of product impairment or unusability. For instance, GRiD says that its line of products (which run the gamut from 8086-based systems to 386-based laptops) can be found in use at the Federal Aviation Administration Radar Facilities, in military communications, at

says. "This extends asset life without requiring a company to scrap its existing equipment."

Overall, survey respondents view power supplies as being the most prob-

IBM is one of the progenitors of the personal computer era, but its leading role in providing desktop machines didn't guarantee early success in the portables arena.

the U.S. Postal Service, and at the IRS. The company adds that its clients tend to operate in constantly shifting loaner pool situations; the amount of wear and tear its products are subjected to in these environments is confirmed by the survey results. Just over a third of the respondents share their GRiD laptops with other users, and the company's systems just about take the prize for the number that are shared by five or more users.

Donald Plumley, president of SaleSolutions Inc. in Irvine, California—a sales/automation implementation service and consulting firm that targets Fortune 500 companies—generally agrees with GRiD's assessment of the environmental factor. "Given the harsh environment they operate in and the traveling they endure, laptops generally undergo a lot of abuse," he says. He should know: in a 30-month time period, his GRiDCase 1530 386 system has been unusable on eight occasions; in ten additional instances it was impaired. While Plumley was admittedly frustrated by his problems, he adds that his experience with the staff at the GRiD Resource Center has been positive. "They've been very responsible. It's a company that stands by its products, and the silver lining is the way GRiD responds—quickly, and in good form."

GRiD also appears to stand by its products in other respects. For instance, a considerably higher-than-average percentage of survey respondents work on used GRiD equipment. GRiD explains that it provides upgrades to the high-end corporations it serves, while working within their established frameworks. "When we coordinate upgrades, we help clients make the transition to using new equipment as well as work with them to incorporate the used equipment," a GRiD representative

lematic component in the GRiD line, although complaints about their insufficiency and failure rates do not greatly exceed the overall average. Indeed, the small base of GRiD respondents means that such problems do not necessarily represent a pattern among the company's products.

OPPOSING VIEWS

Grant Nicholas, an assistant engineer in the Space Sciences division of the New Mexico-based Los Alamos National Laboratory, where sensors for satellites are built, has no complaints about power supplies, or anything else for that matter. He points to the faithful performance of the seven 8086-based GRiDCase 3s his group has been using for about four years to support his claim that "GRiD makes phenomenal devices—and they're American-made." Nicholas adds, "One of our GRiDs failed after a bumpy ride in the bed of a shortbed pickup truck, unseating the ROM card. But this resulted from a failure of our understanding of the forces of gravity, not a fault in the product."

After three GRiDCase 1530 replacements, however, San Jose, California-based attorney George H. Main is a bit skeptical about the company. The victim of system board failures, Main comments: "GRiD has a good concept when it comes to upgrades, but it's been my experience that the hardware isn't as trustworthy as it should be. GRiD needs to work on correcting some bugs and checking its machinery better before sending it out the door."

In fact, GRiD does plan to enhance its products by improving testing procedures. "As a subsidiary of Tandy, we have considerable resources for testing and high capabilities for research and development;

this will allow us to manufacture increasingly reliable, more-rugged machines," GRiD says. Part of the plan for designing products better suited for harsh environments is to develop better shock absorption mechanisms for hard disks. GRiD also employs a special group of analysts to research products where problems have been reported in the first 90 days after purchase.

"Our cutting-edge relationship with Japan will give us higher access and a greater pipeline to technology to benefit our users," says GRiD. To the company's credit, many of the users we've heard from already feel that they have benefited from the purchase of a GRiD laptop. A majority of them report that their units meet their current needs, and most see their GRiDs continuing to be productive for another two or three years.

GRiD Systems Corp., 47211 Lakeview Blvd., Fremont, CA 94538-6599; (415) 656-4700, (800) 222-4743 (sales), (800) 654-4743 (tech support).

CIRCLE 545 ON READER SERVICE CARD

IBM Corp.

by Kellyn S. Betts

COMPANY SCORES



Contact your local authorized IBM dealer.
(800) 426-2468 (dealer information)

Legend: Actual score (solid bar), Average score (dashed bar), High-low range (outline bar)

IBM is one of the progenitors of the personal computer era, but its leading role in providing desktop machines certainly hasn't guaranteed its success in the portable arena. Though the company is now the proud parent of a market-leading luggage, our focus on its service and support of portable computers necessarily reminds us of the products that preceded the well-designed IBM PS/2 Model P70 386.

Remember the 30-pound Portable PC that IBM introduced in 1984? In our issue of October 15, 1985, we called it a "clunky eyestrainer" whose main advantage was that it came from IBM. How about IBM's first laptop, the PC Convertible? We hardly

PORTABLE PCs

gave rave reviews to the 13-pound 80C88-based machine with the CGA screen when it was introduced two years later (*PC Magazine*, July 1986). Its successors, the PC Convertible Model 2 and Model 3—improved with a supertwist screen and a backlit screen, respectively—weren't much more competitive in our eyes (July 1987 and October 27, 1987). But people bought them nonetheless, and through the experiences they and the owners of the Model P70 have had, we can assess the service, support, and reliability IBM can bring to this growing sector of its business in the future.

As IBM's overall scores show, the only area where our survey respondents feel IBM really excels is in repair service. The company's product reliability rating, the level of user satisfaction with technical support, and the percentage of users wanting to buy from IBM again are all average.

FEWER PROBLEMS

According to our survey respondents, IBM's portables are less likely than average to have problems. Two-thirds of the IBM users report that their portables have been unusable or impaired at some time in the past 12 months, while three-quarters of the portable PC users overall had such problems with their machines. In fact, you might be surprised at the travels and conditions some of the earlier IBM models have faced without damage. J. Sanoff, a professor at Stanford University in Palo Alto, California, relates: "I've had the PC

bility of a short circuit. IBM says, "Engineering changes were made to improve performance of the product so that it would stay up and running."

Whether they need repair service or just technical support, when our IBM-portable-using respondents have problems they usually go to the manufacturer or to a retail outlet. Retail outlets include IBM-authorized stores and dealers (like ComputerLand or BusinessLand); the manufacturer sources include the IBM Service Centers and the now-defunct IBM Product Centers.

For both service and support, users who turn to the sources run directly by IBM are far more satisfied with the service they receive than those who patronize its retail outlets. For repair service, the average satisfaction rating for the manufacturer is an impressive 85, while the corresponding rating for the retail establishments is an average 67. For technical support, the manufacturer rating is a solid 76, while the retail rating is an abysmally low 40.

Some respondents have been telling us horror stories. Harry Benton, a programmer for Footprint Tutoring in California, recalls that when he had problems with his Convertible's system board while it was under warranty, he took it in to a local retail shop. It sat there for two months, he says, "and was given back in worse shape than it was when it was originally given to the retailer. It took a second retailer three

should expect for this product (which was an Editor's Choice winner in our issue of March 13, 1990). In general, the experiences of this small group of users mirror those of the larger group of which they are part. The P70 users are, however, more likely than the average respondent to buy again from IBM. And a remarkable 88 percent of these users say the product has lived up to their expectations for it—a much higher percentage than the Convertible yielded.

Joel Bonda, the president of BHP Systems, a Montana-based software developer, says that his P70 has travelled "thousands of miles in a 4-by-4 pickup." He adds that he's had no problems with it since the day it was delivered to him after "rolling around in the back of the Fed Ex truck."

Survey respondents indicate that you will probably be happy with the service and support you get from IBM, especially if you use the company's direct sources. If your IBM experience doesn't please you, an IBM spokesperson reminds us, you're free to go to any other service center. You're "also free to go to IBM and complain."

CIRCLE 546 ON READER SERVICE CARD

Model P70 users are more likely to buy again from IBM; a remarkable 88 percent say the product has lived up to their expectations.

Convertible Model 3 for three years bouncing around Africa and the world, and I've never had a problem. I've opened it up and blown some dust out with no problem whatsoever. In extraordinary voltage conditions, I've never had a problem."

Of course, some users have had problems. Respondents complain about power problems the most; while not significantly above the average in this area, this kind of problem plagues the Convertible line in particular. An upgrade to the Convertible backlit screen originally required installing an upgraded power supply, which IBM later recalled because of the possi-

and a half weeks to get the system board replacement." Thomas McKeon, a product manager for National Computer Systems in Massachusetts, reports that when his Convertible had a battery failure, he went to his dealer and found that "it was very difficult to get answers once you bought the unit."

IBM PS/2 MODEL P70 386

Because fewer than 75 people using the year-old portable IBM PS/2 Model P70 386 responded to our survey, we can't make any far-reaching conclusions about the reliability, service, or support you

Kaypro Corp.

by Jeanne Albrecht

Back in July 1986, when *PC Magazine* reviewed the Kaypro 2000—the company's entry into the PC-compatible, 3.5-inch-disk-drive laptop market—we found our fair share of features to admire, like a detachable keyboard with a good feel, and also a few things to dislike, including the weight, the poor LCD, and the fact that the only way to switch it on and off was by opening and closing the case. In our review of the Kaypro 2000 Plus (March 29, 1988), we noted that whatever our reservations may have been, the 2000 had started many PC users down the portable computing road.

We don't know how many Kaypro systems were actually bought, but we can tell you that only 32 survey respondents own any of the company's laptops, giving Kaypro the second-smallest representation in our survey. While most of them have had their machines for more than three years, quite a few respondents' comments reveal that the systems are generally kept for casual rather than busi-



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CIRCLE 193 ON READER SERVICE CARD

ness use—if they haven't been retired completely.

That's interesting, inasmuch as the company certainly had a chance to make an impact in the laptop marketplace. For instance, the 2000 Plus was one of the first laptops to offer an EGA-compatible display; while it appeared to lack contrast in a well-lit room, it was nevertheless an enticing option for on-the-road users who needed such video capabilities when they were still scarce. But in the words of Joe Hamrick, a mechanical systems engineer in Dayton, Ohio (and the owner of a 2000 model, which he describes as "slick" for its time), "The company let its lead slip away. The 2000 Plus isn't even competitive anymore."

CAN'T GET SATISFACTION

The industry and business press have detailed Kaypro's internal conflicts and

no solutions. I certainly will never consider buying from Kaypro again, though I must say that the case is beautiful and I often feel, as I look at it gathering dust, 'But it was so cute... if only it would have worked!'"

OH, KAY?

In finding Kaypro dealer and third-party resources inadequate to his needs, Fritz is an exception among the survey respondents, who generally gave these sources good scores. But the question of manufacturer-supplied technical support is an issue for those respondents who still use their Kaypro systems more or less regularly. Scores for such support stack up pretty poorly against the average for portable PC manufacturers overall, and at press time, the company was not directly

The question our survey can't answer is whether Kaypro will be able to reemerge as a contender in the laptop marketplace.

its reversion to Chapter 11. Our survey focuses on user satisfaction, and although the base of respondents is too small to suggest a definite pattern about the company's products or services, the people we've heard from are generally not impressed. When it comes to overall reliability, Kaypro receives one of the lowest ratings of all companies, and the percentage of people who say they would buy from the company again is, in comparison with the competition, minuscule indeed.

Richard Fritz, a System Analyst for Library Media Automation in Land O' Lakes, Florida, is one of the less-than-satisfied users. "The Kaypro 2000 was a big disappointment, especially since we had such great satisfaction with our Kaypro 10. We traveled to several continents with the Kaypro 10 and had no problems. But the Kaypro 2000 had a number of bugs—the screen was terrible and the battery system inadequate, for starters—and the dealer was of no help. He told me that the problems were attributable to 'design flaws.'"

Fritz received a little more help from other sources, but no one was able to offer a total solution. "The third-party tech-support hot line number offered a few tips for minimizing the problems but offered

providing technical support of any kind.

The company released this official statement: "Due to the overall restructuring currently occurring, specific information about service and technical support is unavailable at this time. According to Andrew Kay, chairman of the board and founder of Kaypro, the company expects to return to its former policy of 24-hour technical service and support available through the manufacturing company located in Solana Beach, California." Kay also says that "service and support will be handled directly through the existing worldwide network of independent Kaypro dealers."

Unfortunately, hand in hand with the company's current inability to support its users directly is the rather high percentage of respondents who report that problems have rendered their systems impaired or unusable in the past 12 months. On the bright side, users note that their Kaypro systems have been impaired more often than completely unusable; they generally rate their problems as considerably less severe than average.

The question our survey can't answer is whether Kaypro will be able to reemerge as a contender in the laptop marketplace. Stay tuned over the next few weeks (or

months, more likely) to find out.

Kaypro Corp., 533 Stevens Ave., Solana Beach, CA 92075; (619) 481-4300.

CIRCLE 547 ON READER SERVICE CARD

Mitsubishi Inc.

by Karen A. Carter

Mitsubishi's service, support, and reliability are hard to judge from the survey results because so few respondents use MP 286Ls (the only portable models Mitsubishi manufactures). Moreover, many of the 30 respondents who have told us about their Mitsubishi portables have had their machines for only a short time. Among all those who are answering the portable PCs section of the survey, regardless of the manufacturer, the average respondent has been using a machine for 20 months. But the average Mitsubishi owner has used the portable a mere 8 months, which is not enough time to judge the product's reliability fully.

Logically, those who have used their machines the longest are the ones who have encountered the largest number of problems with their equipment. There are exceptions, however. For example, there is Mena Schmid, a mathematics major at the University of California at San Diego who has had her MP 286L for about two years.

Schmid bought the first model, which has CGA video, and has had no trouble with its operation. "It's been a great machine," she says. "I even dropped it off a chair a couple of months ago, and it still seems okay. The problem I had was with the support. I wanted information on an EGA upgrade around the beginning of 1989. I called and called, and then I took the trouble to send a postcard saying I wanted to buy an upgrade, but they never sent me any information. I finally gave up." She says she has not tried to contact the company since then.

Among those who have encountered problems with their systems, the Mitsubishi respondents rate the severity of their problems much lower than most other respondents in the laptop category. Nonetheless, 10 of the 30 say they would not buy Mitsubishis again. The level of discontent this represents is particularly striking if you consider that nearly all of the Mitsubishi respondents had originally selected the make and model they are using.

PORTABLE PCs

MIXED MITSUBISHI VERDICTS

Richard Watland, a public accountant in Seattle, Washington, says the firm he works for has owned three MP 286L portables for about 18 months, and the machines "are worked to death." The dealer from whom the machines were purchased told the accounting company that he could perform repairs on the machines if needed. A few months after the purchase, two of the units' power supplies failed, and they could not be fixed locally; the machines had to be shipped to California at the accounting company's expense.

Watland's major complaint is with the service Mitsubishi provided. "We were talking to the Mitsubishi people, and they would promise the machines by a certain day, and that day would come and go and no machines," Watland says. "They were very unreliable. One of the machines went back twice, and all three times the machines were late by several days. We absolutely wouldn't buy Mitsubishi again because of the bad service we received."

By contrast, Frank J. Goddard, president of TFW Inc., a real estate investment firm in Santa Barbara, California, has had his MP 286L only five months and has received "super" service from Mitsubishi. "I'd only had the machine two or three months when the screen developed a defect," he says. "I called the folks at Mitsubishi, and they told me to send them the machine. They paid for the shipping, and I got the machine back in four days in perfect condition. They even called to check on how the unit was doing. I've also gotten good tech support from them: I've called them with questions and always gotten satisfactory answers." He adds, "I'd buy a Mitsubishi again because of the quality of their products."

Mitsubishi spokesman Robert F. Radke, senior manager of service, says the company is always trying to improve its service, and it has not recently changed its warranty or service policies. He says he was surprised to hear of the complaints some Mitsubishi customers had: "Over the past year we have greatly improved efficiencies in our service department and significantly reduced product turnaround times. A year ago our in-house turnaround time to repair laptops was slightly over five working days. Today, our average time to repair is less than three days." He adds that problems concerning the methods dealers and users employed to ship their equipment may have contributed

"to longer periods for receipt of products for repair."

Radke adds that Mitsubishi has tried to "enhance its service response time for the repair of laptop products by extending to users paid next-day Federal Express service both ways. This assures our customers of fast and quality service, at no charge to them, during our one-year warranty period."

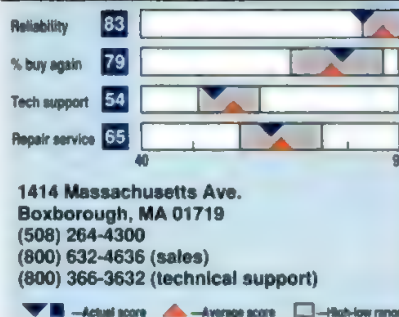
Mitsubishi Inc., Information Systems Division, 991 Knox St., Torrance, CA 90502; (213) 515-3993.

CIRCLE 548 ON READER SERVICE CARD

NEC Technologies Inc.

by Lori Grunin

COMPANY SCORES



NEC's V-30-based machines, for the most part comprising various types of MultiSpeeds, turn up in 1,758 of our survey responses. (By contrast, only 29 80286-based laptop users and 32 80386- and 80386SX-based portable users discuss NEC machines—hardly a large enough sample for sweeping conclusions.) The V-30 users express an average level of satisfaction with their machines' reliability; they are not quite so satisfied with the company's tech support or with NEC's repair facilities.

Of course, just because that turnout of MultiSpeed users have had no more problems, percentagewise, than their peers doesn't mean that they approve of every facet of their relationship with NEC. Guy Gibbs of GCCP in Hatfield, Pennsylvania, is one of the many MultiSpeed users who complain about the documentation: "The documentation for this unit was among the poorest I've ever seen. Worse than a Commodore 64 or 20. The manuals

are lacking in technical detail, poorly worded, difficult to follow, and overly repetitive."

"Early MultiSpeed users probably had reason to feel a little anxiety about the documentation," responds Ron Janusz, a spokesman for NEC. "It might have looked as if it was written in Japanese and translated into English; that's because it was. But starting with the ProSpeed, it was written here. One of the things we put in with our units is comment cards," he continues, "and the feedback on documentation has been exceptional."

The 286-, 386-, and 386SX-using respondents tend to show a lot more diversity of opinion than their lesser-powered compatriots. For instance, the 286-based machines are given high marks for reliability, with a low overall incidence of problems as well as a low problem incidence for the 12 months preceding the survey. Be wary of that conclusion, however, because 41 percent of those systems are only four to six months old, while only 14 percent of all 286-based portable PCs fall into that range. Another mitigating factor—this one counter to the age effect—is that 59 percent of the respondents with 286-based NEC laptops share their machines with at least one other user; that's 13 percent higher than the average for the total pool of 286-based portable users.

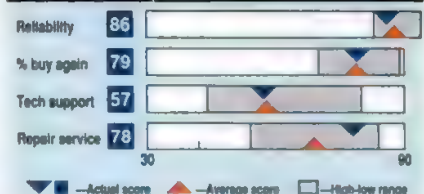
By contrast, 15 percent more users of NEC's 386- and 386SX-based portables report having had a laptop problem than users of similar machines in general. In addition, these users show a lower propensity to share their machines: 19 percent of them share, versus 37 percent for the category as a whole.

NEC Technologies Inc.

8086/8088/NEC V-Series models



NEC MultiSpeed



LIFE EXPECTANCY

Given the relative youth and perceived reliability of the 286-based NEC portables in this survey, it's not surprising that more of these users expect such a system to serve their needs for a longer period of time than their compatriots do. In this case, the average expected life of an NEC is close to three years, as opposed to approximately two years for all other brands.

More important, however, most of the users aren't thrilled with NEC's technical support. The V-30-based laptop users give the tech-support hot line a rating of 46, as opposed to an average of 65 for the pool of compatible systems. The 286 and 386/386SX users are generally more aware of the hot line's existence; 62 percent of the 286 users and 59 percent of the 386 and 386SX users know that the line exists, versus 42 percent and 47 percent, respectively, for all users of similar laptops. Predictably, the number of users who have called the hot line is above the overall average.

company is in the process of expanding its technical support capacities. "By August 1, it will be a 'used-to-be problem' rather than a 'today' problem. The peak problems are behind us now: hold time for the past month has averaged under 40 seconds, and the remaining 30 percent of problems should be solved with the 800 number." The company is installing a single 800 number for all of its products; peak hours run from 11:00 A.M. to 3:00 P.M. Eastern Standard Time.

RESELLER SUPPORT

As for NEC's relatively poor showing for support, part may be attributable to the company's stress on reseller support and service. "We absolutely encourage users to go to dealers and resellers," says Janusz. "Tech support is really a backup to the reseller channel. The reseller has a better handle on the unique applications that the customer needs, and the reseller wants to retain a strong working relation-

Nearly four-fifths of the respondents would buy from Sharp again, but when the company discontinued the PC-7000 and refused to provide upgrades, users of that product resented what they saw as a marketing move.

While the small group of 286-using respondents give NEC's support an average grade, it comes in a poor fourth after third parties, in-house departments, and retail sources. While the few 386- and 386SX-using respondents who have used NEC for tech support rate it a 71, they also express dissatisfaction with the tech-support hot line: 46 percent give it one of the top two ratings, versus 74 percent for the category as a whole. Henry M. Knizeski of Big Rock Environmental Consultants in Ridgefield, Connecticut, says, "NEC tech support is very good once you get connected to a technician." Joyce Flynn, a faculty member at Howard University in Washington, D.C., is quite a bit tougher: "When there's a problem, one is referred to one person after another, is given inconsistent information, and has a great deal of time and long-distance phone calls wasted."

Janusz responds that NEC has already reacted to users' complaints, and that the

ship with customers. The same thing goes for repair." There are exceptions to this general rule, of course. "Any time a new product comes to market, there's a tendency to go back to the manufacturer for support. When we shipped UltraLites for the first time, the phones lit up like a Christmas tree."

But Joyce Flynn remains unsatisfied with both of her experiences with NEC's repair services, even though she went through a dealer. "Both times I've had to have hardware repairs at a shop, NEC delayed the repair by not shipping the part."

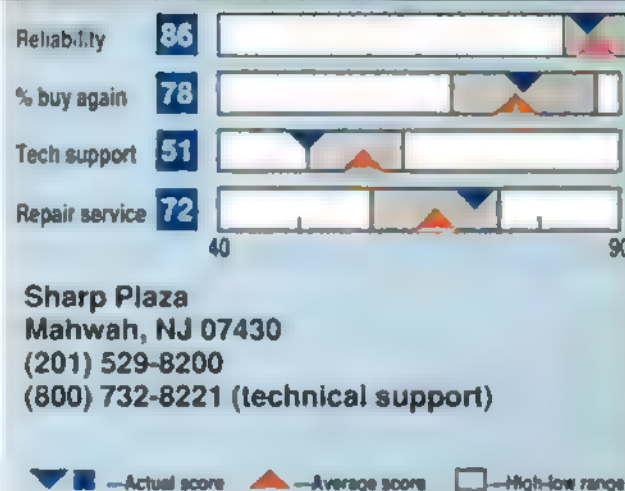
Although respondents sometimes complain about not getting adequate support and service, the proportion of V-30 386 and 386SX laptop users who would buy from NEC again is average, and a slightly higher-than-average percentage of 286 users indicate that they would do the same.

CIRCLE 549 ON READER SERVICE CARD

Sharp Electronics Corp.

by Ann N. Ovodow

COMPANY SCORES



Sharp Electronics Corp. has been in the portable PC market since 1983. The company produces models based on both NEC and Intel chips.

The 89 survey respondents who rely on Sharp units have used their machines for an average of 16 months. When it comes to reliability, the results reveal little difference between processor families: the respondents give Sharp a rating of 86—just a point below the average of 87 for all laptops.

Sharp systems' reliability is often praised. Peter K. Dunn, president of PNG Business Consultants—an accounting, bookkeeping, and tax preparation firm located in Lakewood, Colorado—has been happily using his PC-4521 portable for 15 months. "It has survived thousands of miles of travel without a complaint," he remarks.

Although nearly four-fifths of the respondents say they would buy from Sharp again, product loyalty leads to a different kind of problem for others. When Sharp Electronics discontinued its lunchbox-style PC-7000 and refused to provide upgrades, users resented what they saw as a marketing move. "Sharp's regional representative at the last Comdex advised me to forget about finding a hard disk kit and buy a newer laptop design," says James G. Rickett, Las Vegas license investigator and member of a planning team that advises city departments on computer purchases. "I will," he adds, "but not from Sharp."

Only 25 percent of these 89 respondents have ever experienced problems. Of those who did, slightly more than half say their machines were still usable despite the problem. On the whole, the problems

PORTABLE PCs

are rated less serious than average for the laptop category.

LIMITED SUPPORT

All telephone assistance is handled at Sharp's headquarters in Mahwah, New Jersey. Calls coming in to Sharp's Customer Information Center there—which recently extended its hours to 8:00 P.M. Eastern Standard Time—are first answered by a group of people trained to handle basic questions about a product. Questions requiring more-specialized help are passed to a group of technicians who are trained in the right product category. Calls from dealers go directly to this technical group.

Since only 25 percent of our 89 respondents report having had problems, an analysis of the data has limited significance, but it does show certain trends. Of those who have had problems, roughly twice as many sought help from Sharp as from retailers.

Satisfaction with Sharp's technical support, however, was below the level of customer satisfaction with other companies. Citing difficulty in getting through to technical support, failure to identify the problem, and promised callbacks that never came, respondents give Sharp a satisfaction rating of 39, while the average overall satisfaction rating for this category is 57. Though the sample is small, reactions are intense: users dissatisfied with technical support say they would never buy from Sharp again.

Offsetting this poor opinion of Sharp's technical support, respondents give retailers' technical support a favorable average rating of 72, which contrasts steeply with the 58 score that retailers garnered overall.

Although any retailer can sell Sharp products, Sharp has a network of authorized dealers called SABERS (Sharp Authorized Business Equipment Repair Stations), which service as well as sell products. Users can either have a machine serviced by them or ship it directly to Sharp at any one of five repair depots around the country.

TYPES OF PROBLEMS

Not surprisingly for laptop PCs, screen-related problems are the most frequently mentioned, though the complaints include everything from design defects and broken parts to software flaws and installation difficulties. Other problems cited are failed or defective battery packs, disk

drives, and motherboards, and—though the questionnaire didn't ask—poorly written manuals.

One respondent, Daniel Mayes of Florence, South Carolina, who bought a PC-4502 to use in his missionary work overseas, has had several difficulties. One involved compatibility problems with *DESQview*; Sharp's technical support staff never called back with the required BIOS information. Another time, Mayes installed a Sharp-made 1MB EMS board that gave him error messages. Sharp's technical support was unable to identify the problem, and Mayes was stumped until it occurred to him to remove the board and reinsert it so that the pins made better contact. This worked, but the problem tends to recur. In the process, Mayes learned another lesson: "I'll never buy another machine whose bus takes a proprietary board," he says. "They're far too expensive."

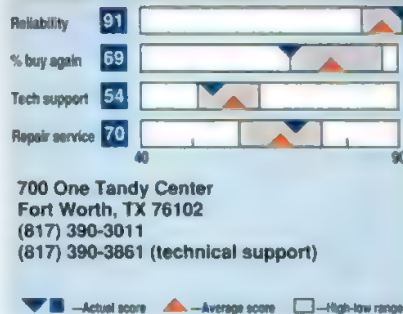
Though Sharp products are more often praised than panned, many respondents feel there is still room for improvement.

CIRCLE 550 ON READER SERVICE CARD

Tandy Corp.

by Kellyn S. Betts

COMPANY SCORES

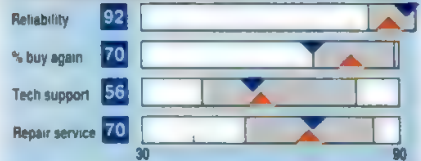


As one of the first companies to offer a true (if non-DOS) laptop computer, Tandy Corp. has had more time to impress its customers than most of the other companies whose service and support policies are reviewed in this issue. Inasmuch as only 69 percent of its portable users responding to our survey report that they would buy from the manufacturer again—a lower-than-average percentage for this category—Tandy evidently hasn't made the best impression.

Tandy's portable users have experi-

Tandy Corp.

8086/8088/NEC V-Series models



Tandy 1400 LT



enced fewer problems than average, and they rate the reliability of the company's products somewhat higher than average. Overall, their satisfaction with the repair service they have received is roughly average, though satisfaction with technical support is a bit lower. So why not buy from Tandy again? Some of our respondents indicate objections to what they consider the high cost of the company's laptop add-ons and replacement parts, but these factors are not the main focus of our survey. Let's look at questions of service and reliability.

A NUMBER OF CONFUSIONS

If they have problems, Tandy laptop users are most likely to turn to a retail source or to the manufacturer. Because so many people associate Tandy with Radio Shack, it's difficult to tell how our survey respondents categorize that source of service and support; a person patronizing one of the 4,900 Radio Shack outlets might legitimately list it as either. Certainly the 2,100-odd non-Radio Shack dealers Tandy authorizes would be thought of as retailers. For technical support, the survey respondents using either of these sources are as satisfied as other portable users are, on the average, giving them ratings of 58 and 57, respectively.

For repair service, the respondents who have used sources they consider the "manufacturer" give it an above-average 68 satisfaction rating. On the other hand, while some write glowing comments about their experiences, as a whole our respondents are significantly less satisfied than average with the service that "retailers" provided, giving this group a 53 rating. (Again, this distinction may not be as clear-cut as it appears, because of the

SERVICE AND RELIABILITY PORTABLE PCs

temptation to think of Radio Shack as both manufacturer and retailer, yet it does seem to imply that non-Radio Shack dealers performed quite poorly.)

Bryant Lyndaker, a lieutenant colonel in the Marine Corps, downrates the service he received because the staff failed to fix his 1400 LT correctly the first time he took it into his local Radio Shack: "They had no repair shop, so they had to send it to Radio Shack in Raleigh. It came back in a few days, but it still exhibited the same problem." The second time round the loop, the Raleigh people discovered the transformer that was the source of the problem and replaced it and the battery without charge. "I thought they probably could have found the problem the first time," says Lyndaker, who indicates that he would still consider buying a Tandy portable again.

The battery problems that Lyndaker reports have plagued a slightly above-average number of users of the 1400 LT,

1100 FD) are "just cantankerous." He says that you can charge such batteries fully and use them for an hour and keep repeating that usage pattern, and soon the batteries don't "believe" they can keep going beyond the hour or two you've used them. He says, "Any nickel cadmium battery needs to be run all the way down at least once or twice a month and then recharged." He points out that the Tandy 1100 FD's lead acid battery saves it from some of the problems that are associated with nickel cadmium batteries.

ALL TANDYS ARE NOT ALIKE

Fewer than 75 1100 FD users responded to our survey, preventing us from making any sweeping statements about its reliability or service record, but we might quote Douglas Rash, vice president and general manager of New York-based Clinicare Systems Inc., who says, "I found

At the onset of the 1990s, Toshiba is one of the largest players in the laptop market. Over one-quarter of the respondents who use portables have a machine with the Toshiba logo on it.

which has now been discontinued and replaced by the lighter-weight FD and HD series. 12 percent pinpoint the battery as their most serious problem or complaint with the computer. By contrast, only 8 percent of all 8086/8088 users and 5 percent of all portable users call it their worst problem. In fact, battery pack failure is the Tandy problem mentioned most frequently.

Alan McKenzie, the data operations manager of the Arkansas Insurance Department, had a battery failure right before he decided to add a "steeply priced" \$1,000 hard disk to his 1400 LT, so he replaced his battery pack at the same time. "When they put in the hard drive, they give you a larger charging transformer, but it doesn't seem to keep it up. I expected the battery to last a little longer than 35 or 40 minutes."

McKenzie isn't the only survey respondent to complain about the 1400 LT's battery life. A Tandy rep explains that the nickel cadmium batteries in the 1400 LT (and many other portables, including all of the other Tandy portables except the

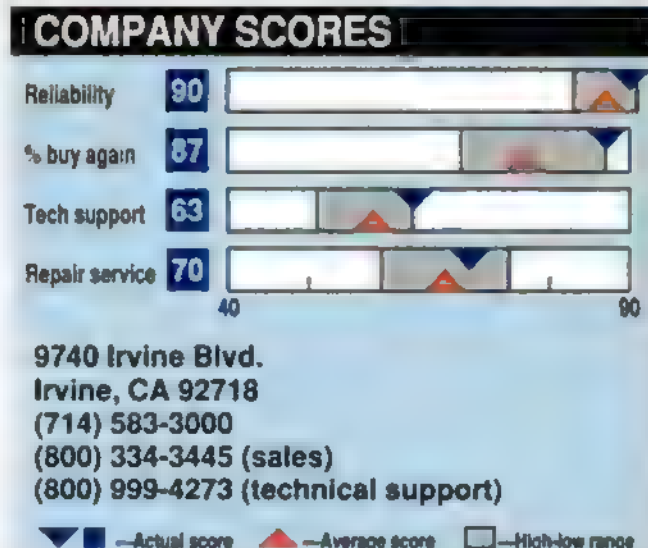
the 1100 FD to be as pleasing as the 1400 LT was displeasing. The battery is more than adequate. I can actually get in an airplane and make it across country and still have some battery life."

This brings us back to the question: Why are Tandy users less likely to buy from the company again? To judge from our survey, it would behoove Tandy to try to improve the service its retail stores provide. Beyond that, perhaps our respondents report that they wouldn't buy a Tandy portable again because they are not aware that the company offers a product with the features that *PC Magazine* deems indispensable in a portable: DOS compatibility, light weight, reasonable battery life, and a good screen. The 286-based 2800—introduced in February—doesn't quite fit the bill, as it weighs 12.5 pounds, but the 1100 FD (reviewed in our issue of March 13, 1990) has all the right features. Perhaps the availability of such a computer is all that is really necessary to make users choose another Tandy portable in the future.

CIRCLE 601 ON READER SERVICE CARD

Toshiba America Inc.

by Lori Grunin



In the mid-1980s laptops emerged as an important market to watch, and Toshiba's T1100 was there, running with a crowd that included the IBM PC Convertible and the Zenith Z-170. Toshiba never lost the early-bird edge; it has continued to churn out model after model, and at the onset of the 1990s, it is one of the largest players in the laptop market. Over one-quarter of the laptop users who have responded to our survey have a machine with the Toshiba logo on it, and more than one out of every three 8086-based laptops in our survey is a Toshiba.

Why so successful? On the average, Toshiba machines have had neither more nor fewer problems than any other portable PCs—especially among the 80286-, 80386-, and 80386SX-based systems. Paul Caswell of Westinghouse's Distribution Control Business Unit, International Division, Pittsburgh, Pennsylvania, sums up his experience with a fleet of globe-trotting Toshiba portables: "If something was going to happen, it happened early. Once we began to use them, they held up pretty well."

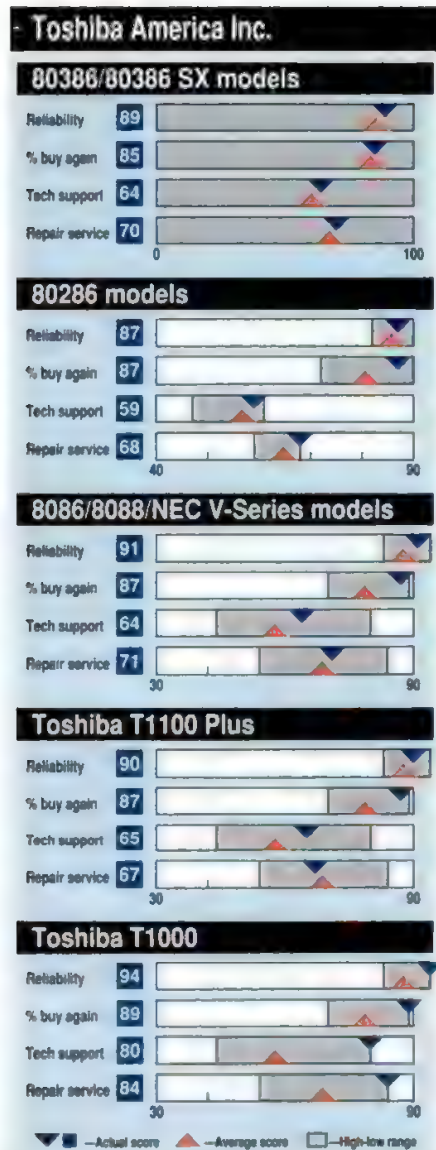
Breaking out the T1000 and the T1100 Plus from the category of 8086s and compatibles teaches a lesson on how averages can hide extremes. Only 21 percent of the T1000 users have ever had problems with their units, as opposed to 34 percent of portable PC users overall. By contrast, 44 percent of the T1100 Pluses have suffered from a problem at some point.

Keep in mind, however, that the T1100 Pluses in our survey average 32 months old, versus 23 months for all 8086-based portables and compatibles. Similarly, 25 percent of the T1100 Plus units are over

three years old, while only 13 percent of the comparable machines can make the same claim.

Interestingly, the T1100 Plus shows an inordinately high percentage of power-related problems, most likely a result of age: 23 percent of all survey respondents who ever had a problem with the machine had power-related troubles, as opposed to just 11 percent for all 8086s and compatibles.

Jeff Bowman, the manager of PC product support for Toshiba, sees no problem there. "The T1100 Plus was discontinued over two years ago. In its product cycle, we never had a problem with the T1100 Plus batteries; we had normal attrition." He does go on to say that Toshiba had a shortage of batteries about three and a half years ago.



RATINGS AND BERATINGS

While respondents with the less prevalent 286-, 386-, and 386SX-based systems rate Toshiba's technical support as average, users of the company's 8086-based portables give it high marks, ranging from 12 points higher than average (for the T1100 Plus) to 17 points above average (the T1000). But while users are generally satisfied with the quality of tech support, they haven't been quite as happy with their attempts to reach the company's representatives.

Dean Chetkovich of the San Bernadino County, California, Medical Center echoes the opinion of many respondents. "Toshiba technical support required a long wait [over 30 minutes] on the phone before a technical person answered. Support was good," he adds.

"With any growing business you're going to have problems keeping the ratio of staff to users at the right level," responds Jeff Bowman, who says that the average wait is around 7 or 8 minutes. It also depends on whether the user calls at a peak time—when the lines open at 7:00 A.M. (Pacific time), and between 11:30 and 1:30 when the staff goes to lunch.

Users also give Toshiba's repair services a slightly higher-than-average rating, although once again the averages hide some extreme feelings. For instance, when Lag Volt Systems' district sales manager David Aukamp's T1200HD had an internal power supply meltdown, he says, "Toshiba fixed my laptop in record time, no questions asked—even replaced the cabinet. It took five days door-to-door [Florida to California]."

On the other hand, Jon Bryan, an engineer in Lexington, Massachusetts, ran into problems with his T1200HD at the beginning of the year, when Toshiba was undergoing a widely publicized overhaul of its parts-tracking system, and he had to wait over three months for a new part. "Their repair agent and I are both beating on them without success," he said at the time. "I'm sure many Toshiba users are quite upset right now with the lack of response." For a previous problem he had experienced, however, he admits "they rated a perfect score in service," and he remains a loyal user.

In addition to the usual one-year parts-and-labor warranty, Toshiba offers an extra-cost Exceptional Care warranty. Although our survey results do not differ-

entiate between users with the standard warranty and those with additional coverage, a casual perusal of comments reveals some ambivalence. Robert Gose of Medical Imaging in Lawton, Oklahoma, complains, "Toshiba had my portable for two months while under Exceptional Care to replace a design defect, and I could not motivate anybody there to give a damn and send me a replacement or a new machine. Exceptional Care indeed!" While Gose's difficulties with Toshiba were occurring amid an unusually chaotic time at the company—the aforementioned parts-tracking overhaul—they left quite an impression. After three months of continual phone calls, he continues, "I complained, and they said they'd extend my Exceptional Care for two months. They never did. I will never deal with them again."

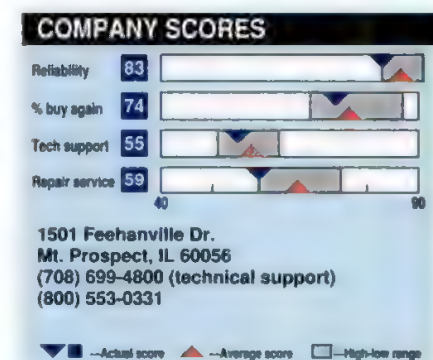
Gose's further comments reflect some respondents' experience in dealing with Toshiba by mail: "I live out in the boon-docks. I do everything by mail; I've bought \$60,000 or \$70,000 of computer stuff by mail in the past year. If I've ever had trouble, I can always call somebody and get it straightened out." But with Toshiba, he says, "I couldn't even get to talk to anybody who could help. It was very frustrating."

Despite such frustrations, 87 percent of Toshiba users say they would buy from Toshiba again—and this is 10 percent above the average for all portable PC respondents.

CIRCLE 602 ON READER SERVICE CARD

Zenith Data Systems

by Matthew J. Ross



Zenith Data Systems was one of the first players in the portable PC market, so it's not surprising that the manufacturer has one of the largest survey response bases.

PORTABLE PCs

683 respondents say that they are Zenith laptop users. And 169 respondents specifically identify themselves as SuperPort 286 users.

Among these SuperPort 286 respondents, the average length of use has been 13 months, with 53 percent of the respondents having used the machine between 10 and 18 months—long enough to develop familiarity with the product, but not as long as the 20-month average of all laptop users in our survey. Including those who use the Z-181, Z-183, SuperPort, and other models, the Zenith portable users responding to our survey have averaged 18 months with their portables.

SUPERSPORT 286

The overwhelming majority (92 percent) of SuperPort 286 users started fresh with a new unit, but Zenith users overall are below average in terms of how many of them could choose the brand of laptop they use. Among the 4,087 survey respondents using portables, 76 percent have chosen the brand of portable PC they lug around with them, compared with only 71 percent of the Zenith users and 67 percent of the SuperPort 286 users. This phenomenon may be the result of the many government contracts that Zenith has won.

The SuperPort 286 has done little to distinguish itself as a reliable machine. Only 59 percent of our respondents report

an unofficial wall unit [not a Zenith battery charger], and the thing ran like crazy. I got much better battery performance. This leads me to believe that the Zenith power system and recharger are insufficient."

Callander's other problem concerns corrosion between gold-tipped integrated circuits and the chip sockets, which occasionally prevents the system from booting up. Periodic cleaning and lubrication of the contact points corrects this problem. Still, Callander is satisfied. "My SuperPort is too heavy, and the display isn't terrific, but overall it's been a rugged performer."

Among our respondents with problematic SuperPort 286s, the battery is the one area almost totally without incident. Only 2 percent of those specifying problems identify the battery, and just 3 percent of the group complain about the power system in general. 18 percent of those experiencing problems mention the screen, and 9 percent list system board problems; these two were the product's primary weaknesses.

Doyle Pope, a senior computer support specialist at the University of Florida in Gainesville, has been involved with Zenith products for a couple of years and currently owns a SuperPort 286. Pope

Fewer Zenith users than average chose the laptop they use, which may be the result of the many government contracts Zenith has won.

never having had a problem; this is slightly below the overall portable average of 61 percent. The significant statistic is the severity rating given by those SuperPort 286 users who report having had at least one problem. 46 percent of the Zenith 286 respondents call their problem "very serious"; among those users with problems in the overall laptop pool, only 31 percent report this degree of trouble.

Allan Callander of Minnetonka, Minnesota, has had his SuperPort 286 for a year and half. Callander mentions two problems: "Battery life is very poor. If you charge the laptop with the system off, it takes well over 8 hours to recharge—as much as 24 or even 48 hours. The reason I discovered this was I brought it in on another problem. My dealer charged it on

has experienced problems with his floppy disk drive: "I had the unit several months and initially experienced diskette problems. It turned out to be a motherboard problem. I brought it to the authorized Zenith service center at the university, who had been notified by Zenith of a problem." Pope's unit underwent a standard overhaul, but when that did not correct the problem, the service center installed a new motherboard.

"Since then it seems to be quite reliable," he relates. "Once it's been used for a while and you get past any infantile problems, Zeniths seem to run forever." Pope adds that the service center that repaired his unit was very responsive and fast, even though he didn't purchase his SuperPort 286 from that outlet. He has

Zenith Data Systems

Zenith SuperPort 286/286e



8086/8088/NEC V-Series models



Zenith Z-183 Portable PC



Zenith Z-181 Portable PC



Legend: Actual score (dark bar), Average score (light bar), High-low range (outline).

also dealt with Zenith's own tech support. "They are quite responsive. If you can find out the tech support number, it doesn't matter who you are. They're pretty willing to help."

ALL KINDS OF SERVICE

That Zenith technical support is available via a toll-free telephone number for those customers who purchase an extended service contract from the company. Zenith also offers an Information Resource program, which includes a special bulletin board service for sharing information; this costs \$1,200 per year. One other package is Zenith's Insured Quality program, which entitles users to replacement equipment in the event of failure on the next business day.

Zenith takes a three-level approach to maintaining and serving its products. For customers with contracts, direct service is available. The two other providers are authorized and preferred service centers, and strategic third-party providers. The overall quality of technical support for Zenith laptops is rated 55 by our survey respondents, which is equivalent to the

PORTABLE PCs

average score calculated for all laptop vendors. The repair service, with a rating of 59, lags the overall quality of laptop repairs by 8 points.

Concerning service, Callander says: "I've received fair treatment from the Zenith dealers. They haven't bent over backwards, but we're a small company. We've got a couple of computers and the one laptop, so we're not their highest priority."

8088 PORTABLES

Users of Zenith's Z-181 are among the most satisfied in our poll. 67 percent of those responding have never had a hardware problem, while those who did experience problems give them a low 46 severity rating (compare this with an average 57 severity rating among all laptops and a 53 severity rating among all 8086/8088-based portables). And this comes from Z-181 users who have averaged 28 months of hard work with their Zenith portables; that's eight months greater than the overall average.

Bruce Lightsey has used his Zenith backlit 8088-based laptop for almost two years at the Mississippi Department of Human Services at Jackson without a problem. "I used the Zenith as a terminal for an IBM 3090 mainframe with *Kermit* software. The only problem I ever had was with the phone cord for the modem, so I bought a new cord."

Zenith Z-183 users aren't nearly as satisfied with the performance of this machine. Only 59 percent report never having had a problem, while those with problems rate the severity at 64, which is 11 points above other 808x-based portables, and 7 points higher than the average rating of 57 given by all laptop users in our survey who report problems.

Zenith finishes right in the middle of the pack, largely thanks to the favorable responses it receives from users of the SupersPort, the Z-181, and Zenith's 386-based portables, the SupersPort SX and TurbosPort 386. Perhaps the most crucial score comes from the survey question that asks, "Would you buy from the same manufacturer again?" Zenith receives a 74 percent favorable response (as compared with 77 percent overall). While Zenith seems to be supporting its customers satisfactorily, this doesn't mean there is no room for improvement. ■

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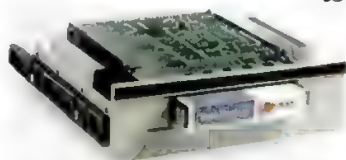
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CIRCLE 473 ON READER SERVICE CARD

THIRD-PARTY SERVICE FROM WARRANTY TO ETERNITY

Sooner or later your computer will teach you the painful lesson that it is not immortal. No matter how powerful your system, eventually some type of hardware failure will render it useless. Preparation for that failure can help your business avoid pain and aggravation, not to mention a perilous loss of productivity.

Over the years, *PC Magazine* has covered many products, including backup software, file-recovery programs, tape drives, and uninterruptible power supplies that help minimize your chances of trouble or save you once it hits. This time, we'll look at how to get help from outside sources when you really need it. The thriving industry of third-party service is eager to repair your computers or peripheral devices; companies offering service range from Fortune 500 giants like Bell Atlantic, IBM, GE, and TRW to one- or two-man shops that service only their local area.

EXTRA PROTECTION

Whether you're an independent consultant working from your office at home, or a national corporation with thousands of PCs, it's important to consider some type of computer protection that goes beyond the manufacturer's warranty. Why? Warranties only cover specific things, and only for a limited period.

In order to be prepared for out-of-warranty service problems, most companies buy a service contract to cover equipment maintenance. Some very large companies obtain service contracts directly from product vendors as part of their sales agreement. Often, businesses use a combination of other services to maintain their

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BY
CHRISTOPHER
STETSON
WITH
ASSISTANCE
FROM
MARGHERITA
McBEAN

arranties don't last forever, and neither will your company's computers or peripherals. Third-party service organizations can be a big help when your warranty runs out or doesn't cover the repairs you need, but shop around for the one that will best meet your requirements.

computer systems: an in-house department or perhaps just a knowledgeable person on staff. In such cases, the third-party service provider enters the picture to solve problems beyond the ability of the other resources. For example, Ziff-Davis has an internal service department to handle routine maintenance of the company's computers; however, because of the sophisticated nature of the equipment in *PC Magazine* Labs, and the time-critical nature of the magazine business, PC Labs has a contract with a third-party organization to provide service not available from our internal department.

The PC service and maintenance industry is a rapidly expanding business; when it first began about five years ago, an IBM AT was state of the art, and most PCs were used for standalone tasks, such as spreadsheet analysis and word processing. Back then, the most important feature of a service organization was its ability to fix a broken machine. In today's computer mar-

ket, where PC servers are replacing mini-computers and large networks are connecting once-isolated PCs together to form mission-critical systems, service organizations are finding that they need to provide more than just a quick fix. Installation services, life-cycle maintenance, product training, and nationwide on-site service capabilities are becoming important issues for many companies.

Service vendors pick up at the point where a manufacturer often leaves off—the servicing of warranted and out-of-warranty equipment. The largest service companies, which are the focus of this article, have nationwide or international locations with technicians available to your site, or receive equipment returned for repairs. They often provide extras like training, data or system conversions, installation help, and telephone or on-line support. The costs for these services vary not only from company to company, but within the service contracts offered by the

THIRD-PARTY SERVICE

individual service vendors. Contracts can be specifically tailored to each customer or offered as a standard "boilerplate" contract, depending upon how much you want to spend, and the service organization's level of flexibility. All of the companies reviewed here stress that there are numerous variables that can make two contracts for identical pieces of equipment have entirely different fee structures.

Surveying the top service companies and reporting on the types of services they offer can't be accomplished by running benchmark tests. You can't time service, or put it in an isolated environment to test

ing of some of the terminology is a prerequisite to a good contract. A computer warranty usually provides the assurance that if the product fails because of a defect, the manufacturer will service it at no (or at a reduced) charge for a specific period of time. You shouldn't confuse this with a guarantee, which covers the quality of a product or service; a guarantee typically offers you money back if it does not meet expectations of quality or performance. A guarantee is fairly unusual in the computer business.

Carry-in service is generally the least expensive way to repair equipment because the burden of transportation is placed on you.

its features. Service is a relationship that exists between two companies and has many subtleties that cannot be covered in even the most comprehensive contracts. So use the information in this article to acquaint yourself with the available sources, but be careful when you select a service provider—make sure you feel confident about the type of service you need and that the company can satisfy your requirements before you sign any contracts. Remember that even the most reputable nationwide chains have some shops that are overworked or underequipped.

SOME SERVICE DEFINITIONS

When shopping for service, you need to be careful not to purchase overlapping services—for example, you don't want to pay for a service contract on equipment that is already under some type of warranty. If you have a lot of products that are still under warranty, you should try to negotiate a deal with the third-party provider to specifically exclude warrantied products from the contract. (It's worth noting that an important type of coverage is not addressed in this article: fire insurance, theft, or other loss. Insurance can be obtained either from your general insurer, or from a specialist in computer insurance such as Safeware, The Insurance Agency Co. in Columbus, Ohio ((800) 843-3469).)

In order to negotiate a good service contract, it's important to understand your risks. When you do your research, you will encounter jargon related to warranties and service providers, and an understand-

Warranties are effective for specific time periods—typically 30 days, 90 days, one year, or longer. A computer manufacturer offers a warranty for the equipment it sells to assure customers that it stands behind its products. Since some warranties are more comprehensive than others, a close reading of the warranty is important to understand exactly what is covered if the product requires service. (See the sidebar "Reading the Fine Print: An Anatomy of a Warranty.") Most warranties include some kind of service by the warrantor within the warranty period. When the warranty expires the original deal is effectively void, and it's up to you to cover repair costs when problems arise. An extended warranty is a renewed agreement for a specific period of time, offered by the manufacturer, vendor, or service provider (who becomes the new warrantor). Unlike the initial warranty, which is included in the cost of your product, there is usually a fee for the extended warranty.

A few manufacturers service their own equipment. Others, because of distance and/or time and personnel constraints, make arrangements for outside parties to handle their service problems. Northgate, for example, hires TRW to perform its warranty work.

After you have determined what is covered by the equipment warranty, and the cost and level of support for extended-warranty options (if they're available), you are ready to look at some service contracts. Service companies often divide the service they offer in their contracts into four main

categories, with a typical service contract being a mixture of two, three or all four. The manufacturer, its physical location, and the items that are internally and/or externally attached to it, are major factors taken into account when the contract is drawn up and a fee table computed.

APPROACHES TO SERVICE

With **on-site service**, as its name implies, your equipment is serviced on your premises. You place a call and a technician responds within a given time period—usually established in the contract (on the same business day, within 24 hours, etc). Response time, however, is not repair time: it may take hours or even days to correctly diagnose and fix what ails your computer or peripheral. Actually, for companies with a very large installed base of PCs, many service companies will even arrange to have permanent on-site service personnel who act as in-house troubleshooters and repair people.

Carry-in service is exactly the opposite of on-site service: instead of bringing the service to the computer, you bring the computer to the service. Carry-in is generally the least expensive way to repair your equipment because the burden of transportation is placed on you. The number of centers a company operates (some have branches in every major city, others in only a few regions) can be an important factor. If your company is not in a metropolitan area, it may be quite a distance to the nearest service center. To complicate matters, most are open only during business hours, forcing overnight or weekend waiting periods if your hard disk crashes at 7 P.M. on Friday. Some service companies offer free loaner or rental replacement equipment to make the repair interim more bearable, but be sure to ask for this since it's often not offered.

Mail-in service steps in where carry-in leaves off: if you are near a United Parcel, Federal Express or United States Postal Service office, you are that close to a central repair depot. Mail-in service is generally best suited for computer owners who are too far from a service center. Mail-in service adds both time and cost to computer repair because shipping a CPU is time consuming and expensive. Most service companies will, if you have a contract with them, pay to ship the product back to you the same way that you shipped it in, known as mirror shipping. IBM's service agreement for the new PS/1 is similar to that type of mail-in arrangement; after diagnos-

READING THE FINE PRINT: Anatomy of a Warranty

by Christopher Stetson

The mock-up warranty you'll find below has many of the elements that you might see on the warranty of your own PC. Unfortunately, unless you have a degree in law, you may never fully understand the finer points of your warranty. The explanations here (which correspond to the highlighted numbers in the mock warranty text) are in plain English and will make deciphering your own product warranty a little easier.

1. Some computer companies, including Apple, Compaq, IBM, and Toshiba sell their systems to the public through retail channels. A retail store must be authorized by the manufacturer to sell a computer in order for you to receive the benefits of the warranty. Some mail-order houses, and a number of gray-market shops, will sell these computers even though they are not authorized. If you buy from an unauthorized dealer, you don't retain the right to warranty service. The same also applies if you buy the computer from your cousin. Find out if the brand you want requires an authorized dealer, and if the dealer who wants to sell you the computer is authorized.

2. When a component or the whole product needs to be replaced, the replacement you receive may not always be new. Many companies will replace a component in your computer with a new part as a matter of policy, even if the company retains the right to replace it with refurbished equipment. However, you should be aware of this right and consider it when looking at a warranty.

3. This part of the warranty puts all repair liability on you for problems resulting from faulty installation, misuse, acts of God, or whatever. This is the legal way of saying that the manufacturer will fix only problems that were made by the manufacturer.

4. Sometimes the computer you want is the one that has been on display in the store. It's the last one they have, the one in the window with the neat animation describing how powerful it is, the one the salesperson will sell to you for just a little above cost. But consider this before you buy: under the terms of this warranty, ICS could void all rights to warranty repair. In the end, the lower price may be the better bargain, but

you should make a risk/benefit analysis before buying.

5. Consumer law in the United States is extensive and tries to protect the consumer as much as possible. Consumer law was developed to help protect the unwary from, among other things, warranty disclaimers. In most states, if you buy a product, you are entitled to implied warranties inherent to the product, as well as express warranties stated in the advertising. However, if the product is sold as a business rather than a consumer product, ICS can dodge this body of law. How well this holds up depends on the product and the circumstances under which it was purchased. In any case, this does add to the credibility of the manufacturer's argument, and if it goes to court you'll need to shell out lawyers' fees.

6. The ICS warranty states that if none of the limitations in its warranty void your rights, it will only repair or replace the product. It

will not give you your money back, because warranties are not money-back guarantees. A guarantee has different legal implications altogether and is rarely if ever found on computers. ICS will replace or repair the product, but not compensate you for any damages resulting from the product's malfunctioning or breaking. So if your power supply starts racing during a hard disk optimization and subsequently wipes out all your tax records for the past three years, you'll have to pay the accountant to put it all back together.

The good news about all this is that in most cases you will be able to get warranty work done on your computer, even if you have voided the warranty in some minor way according to its limitations. Many times manufacturers or vendors won't ask or don't care how the product broke—they'll just fix it because you are a valued customer. But remember, if push comes to shove, the manufacturer and vendor have a document to protect themselves. ■

Limited Warranty

International Computer Systems Inc.
666 Ellis Boulevard, Houston, Texas 56456;
(800) 555-2621

ICS warrants this ICS Computer Product to be in good working order for a period of one year after purchase by the customer from ICS or an ICS (1) authorized dealer.

If this product fails to be in good working order during this one-year warranty period, ICS will, at its option, repair or replace the Product. Repair parts and/or replacement Products (2) may be either new or reconditioned at ICS's discretion. (3) The limited warranty does not include service to repair damage from improper installation, improper connections with peripherals, external electrical fault, accident, disaster, misuse, abuse or modifications to the Product not approved in writing by ICS. Any service repair outside the scope of this limited warranty shall be at ICS or its Authorized Service Provider's rates and terms then in effect.

This warranty is valid only within the United States and Puerto Rico and applies only to (4) Products that are new and in cartons that are unopened on the date of purchase.

All other express and implied warranties for this Product, including the warranties of merchantability and fitness for a particular purpose, are hereby disclaimed. (5) The Product covered by this warranty is marketed and sold by ICS as a business rather than consumer product and is not intended for a personal, family or household use. Some states do not allow the exclusion of implied warranties or limitations on how long an implied warranty lasts, so the above limitations may not apply to you.

(6) If this Product is not in good working order as warranted above, your sole and exclusive remedy shall be repair or replacement as provided above. In no event will ICS or its parent company be liable to customer or any third party for any damages in excess of the purchase price of the product. This limitation applies to damages of any kind, including any direct or indirect damages, lost profits, lost savings, or other special, incidental, exemplary, or consequential damages whether arising out of the use of or inability to use such product, even if ICS or an authorized ICS representative or dealer has been advised of the possibility of such damages or of any claim by any other party. Some states do not allow the exclusion or limitation of incidental or consequential damages for some products, so the above limitations or exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights, which may vary from state to state.

THIRD-PARTY SERVICE

ing the defective component by talking you through the analysis over the phone, IBM will send you a replacement part before you send in your defective component. You should also note the number of mail-in service centers a company has—while some delivery services will send a package across town or across the U.S. at the same price, others charge variable rates according to distance.

Whatever service you opt for, you should investigate certain things. For example, does the company keep a client's service problems on record to monitor recurring problems or reference work already done on particular machines? Such a setup allows the service vendor to learn what problems your equipment is prone to, and develop the best strategies for handling them. Is loaner or rental equipment available while your ailing system gets fixed? What are the terms for cancelling (or "killing") a contract?

Time and materials service (or T-and-M service, as it is commonly called) is service—on-site, carry-in or mail-in—that is not part of a contract. You are charged for T-and-M service when there has never been a service contract, when a service contract has lapsed, or when damage occurs to a system for reasons not covered in the service contract. T-and-M fees can be very high, even for the smallest repair, making service contracts look very attractive. Labor is usually the most expensive part of service. It is not uncommon to pay \$100 per hour for labor. If a system requires on-site service, many companies will charge a minimum fee to send the technician to the site, even if the service center is just down the street. The cost can escalate if your location is more than a certain number of miles from the servicer. Some companies don't charge for transportation and just bill by the hour—as soon as the technician leaves the center.

BETTER SHOP AROUND

Before signing a service contract, it's a good idea to shop around and ask a lot of very specific questions. When we asked the vendors to quote prices for hypothetical computer installations, we received ambiguous answers. Some of the service companies have left a number of areas open to negotiation, so try and get some competitive bids. An important question to ask a potential service company is whether it is a manufacturer-authorized service company for your equipment. If the answer is yes, that means the manufacturer is

likely to be providing up-to-date training, parts, and expertise to the technical staff; if not, you should inquire about parts availability and technical information. When you're asking about companies for which it is authorized to provide warranty service, be sure to specify exactly what model or type of product you have. Many service companies cover only certain product lines within each manufacturer's brandname.

We focused on nine of the largest nationwide service vendors, with a medium-sized regional service company added for comparison. If you're interested in a complete list of service companies, there is a two-volume reference work, titled "NACD Profile Series—Service Companies," published by the National Associa-

Data Resources, but it would not respond to our specific questions.

We requested information about a variety of service-related topics from these vendors, and summarize it in the features table. A portion of the information focuses on the hypothetical computer installations, which we asked the companies to return a bid on. These hypothetical installations (described in the sidebar "Hypothetically Speaking: Some Typical Installations") were designed to give the service vendors a chance to more fully describe particular services that they provide to clients, ranging from the single user to a large, nationwide company. We emphasized to the vendors that the price quote aspect was only one part of the questionnaire, and that providing us with options and recommendations was probably the best way of dis-

Time and materials service is service that is not part of a contract. T-and-M fees can be high, even for the smallest repair, making service contracts look very attractive.

tion of Computer Dealers. This reference book provides a list of more than 3,000 companies that provide service in the United States.

The companies we investigate and report on in this article are composed of two groups: the companies that sell both computers and service, and the companies who primarily offer service. In the first group are the "big three" computer sellers: IBM, ComputerLand, and BusinessLand. For the second group, we targeted the largest of the nationwide service providers: Bell Atlantic Business Systems Services, TRW, GECS, Intellogic Trace, Idea Servcom, and NCR. In addition we looked at Touch Tech, a mid-size company that services the northeastern region of the U.S., to compare how a typical regional vendor stacks up to the big guys.

Other large companies not represented here include Dataserve, McDonnell-Douglas Field Service Co., and Decision Data Services. Dataserve did not supply any information about itself or answer the questionnaire, and McDonnell-Douglas Field Service Co. was in the midst of a buyout offer and was unable to respond. Decision Data Service provided a brochure detailing its merger with Momentum Technologies in 1988 and its 1989 acquisition of the FDR Field Service Co. of First

tinguishing themselves. Because of the flexible and negotiable aspect of service contracts, there were some cases where a company's responses or policies did not exactly fit our direction. TRW, for example, indicated that many items were negotiable, whether they were "standard" or not. In such cases we use the answer that we believe will be of most use to you, or give a fuller, annotated explanation in the company profiles below.

HYPOTHETICAL SITUATIONS

Although the vendors' bids regarding the hypothetical installations are generally similar, some companies did respond uniquely. BusinessLand, for example, proposed doing an in-depth analysis for the medium and large installations to determine if users required training, and to see if the systems needed upgrading. Some others declined to give us a quote at all.

Most of the organizations listed below began focusing on PCs in the past five years. Originally, they were maintaining mainframes or minis. As PCs began to integrate with these systems, the companies expanded into the PC area. Some of the companies, like BusinessLand and ComputerLand, have been in the microcomputer business from the start and service almost nothing but PCs.



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CIRCLE 107 ON READER SERVICE CARD

HYPOTHETICALLY SPEAKING: Some Typical Installations

This breakdown of equipment typically found in environments ranging from the single-user office to the large corporation shows the factors that influence the price of a service contract. We listed diverse computers to find out whether the service companies would handle a variety of brands. The scenarios involve systems that were noted as being one year old or more and no longer protected by their warranties.

These descriptions were sent to the third-party service companies for their bids. While some companies preferred not to offer any direct quotes, most of them provided responses, which you can find in this article's features table.

Single-User Installation

A person works in a small office with one computer. The computer is a critical piece of equipment, since the user relies on it for almost every business-related task.

Computer:

- 1 IBM PS/2 Model 70, 3MB RAM,
- 1 NEC MultiSync 2A monitor

Printers:

- 1 Epson FX 85
- 1 HP LaserJet Plus

Modem:

- 1 Hayes V-Series, 2,400 bps

Small Installation

A company has opened a new office in a metropolitan area. It's a small office, employing 15 people who rely on ten standalone computers, which are used mainly for word processing or accounting. One of the computers is reserved for the staff engineer, who has a basic CAD setup.

Computers:

- 2 IBM ATs: 1 with monochrome monitor, 1 with CGA monitor
- 2 IBM XTs, both with monochrome monitors
- 1 Compaq Deskpro 386/25 with a VGA display, 73MB RAM, 1 mouse
- 2 Compaq Deskpro 286s with VGA displays; 1 with 1MB RAM, 1 with 2MB RAM, 2 mice
- 1 NEC PowerMate I with EGA display, 1 mouse
- 1 Zeos 386 with EGA display
- 1 Toshiba T1000 laptop

Printers:

- 3 Epson FX-80s
- 1 Epson LQ-1500
- 1 IBM Quietwriter III
- 2 HP LaserJet Series IIs
- 2 NEC P-7s

Modems:

- 4 Hayes modems: 2 1,200 bps, 2 2,400 bps
- 1 Racal-Vadic modem, 9,600 bps

Medium-Size Installation

An MIS manager of a large company must obtain a service contract for the regional offices. Most of the roughly 250 computers are located at the regional corporate headquarters, with the rest in branch offices around the state. Computers connected to a Novell *NetWare 386* network are marked with an asterisk. The graphics department is Macintosh-based and on an AppleTalk network.

Computers:

- 25 IBM PS/2 Model 50s with 2MB RAM
- 25 IBM ATs with CGA displays
- 30 IBM PCs and XTs with monochrome displays
- *20 IBM PS/2 Model 70s with 4MB RAM
- *1 IBM PS/2 Model 80 server with 10MB RAM
- *15 Compaq Deskpro 286s with EGA displays, 2MB RAM
- *10 Compaq Deskpros with monochrome displays, 640K RAM
- *6 Compaq Deskpro 386/25s with VGA displays, 4MB RAM
- 3 Zenith 286s with EGA displays
- 3 Zenith 8088s with monochrome displays
- 1 Zenith 386 with VGA display
- 8 AT&T 286s with monochrome displays
- 5 AT&T 8086s with monochrome displays
- 3 AT&T 386s with VGA displays
- 6 HP Vectra 286s with EGA displays
- 4 HP 8088s with monochrome displays
- 3 HP Vectra 386s with VGA displays, 2MB RAM
- 6 Toshiba 286s with EGA displays
- 7 Toshiba 386s with monochrome displays
- 2 NEC PowerMate 386s with VGA displays
- 5 Northgate 286s with VGA displays
- 7 Zeos 286s with monochrome displays
- 12 Everex Step 386s with VGA displays
- 5 NEC PowerMate 286s with EGA displays
- 10 Macintosh SEs with 1MB RAM, 40MB Apple hard disks
- 7 Macintosh IIX's with 4MB RAM, 150MB Quantum hard disks
- 10 Toshiba T1000s 6 Compaq LTEs
- 4 Zenith laptops 4 NEC 8088 laptops

Printers, plotters, scanners:

- 214 printers, 4 plotters, and 5 scanners representing a wide variety of manufacturers and models

Modems:

- 37 Hayes modems: 20 1,200 bps, 14 2,400 bps, 3 9,600 bps
- 35 Racal Vadic modems: 17 1,200 bps, 12 2,400 bps, 6 9,600 bps
- 9 Codex modems: 5 1,200 bps, 2 2,400 bps, 2 9,600 bps
- 9 Case modems: 4 1,200 bps, 4 2,400 bps, 1 9,600 bps
- 9 AT&T modems: 6 1,200 bps, 3 2,400 bps

7 U.S. Robotics modems: 3 1,200 bps, 3 2,400 bps,
1 9,600 bps

20 modems from other manufacturers

Add-ons:

50 3Com, EtherLink II, and EtherLink Plus cards

40 Logitech Bus Mice

41 Microsoft Bus Mice

10 internal fax modems

Large Installation

A VP of MIS needs a service contract for a nationwide organization with sites in most states; a number of the larger sites are in the eight major metropolitan areas. Three DOS-based, sensitive-data locations need special attention. Approximately 10 percent of the computers cannot be down for more than 2 hours (these are marked with an asterisk).

NetWare network (45 Advanced NetWare 286 network computers, with 15 connected to the 3270):

*45 IBM PS/2 Model 80 servers with 10MB RAM

600 IBM PS/2 Model 50s with 2MB RAM

220 IBM ATs with CGA displays

210 IBM PS/2 Model 30s

340 IBM PCs and XTs with monochrome displays

*300 IBM PS/2 Model 70s with 4MB RAM

250 Compaq Deskpro 286/E's with EGA displays,
2MB RAM

165 Compaq Deskpros with monochrome displays,
640K RAM

55 Compaq Deskpro 386/16s with VGA displays,
4MB RAM

*45 Compaq Deskpro 386/25s with VGA displays,
4MB RAM

Nonnetworked computers:

110 Dell System 210s with monochrome displays

40 Dell System 325s with VGA displays

75 Everex Step 386s with VGA displays

45 Zenith 286s with EGA displays

70 Zenith 8088s with monochrome displays

30 Zenith 386s with VGA displays

85 AT&T 286s with monochrome displays

50 AT&T 8086s with monochrome displays

30 AT&T 386s with VGA displays

70 HP Vectra 286s with EGA displays

45 HP 8088s with monochrome displays

25 HP Vectra 386s with VGA displays, 2MB RAM

65 Toshiba 286s with EGA displays

40 Toshiba 386s with monochrome displays

60 NEC PowerMate 286s with EGA displays

40 NEC PowerMate 386s with VGA displays

40 Northgate 286s with VGA displays

40 Zeos 286s with monochrome displays

65 Compaq LTEs

65 Zenith laptops

70 Toshiba T1000s

20 NEC 8088 laptops

TCP/IP network:

14 Sun 386i stations

21 Sun SPARC stations

3 Sun 4/260s

30 HP 9000s

47 Apollo workstations

DECnet network:

30 DEC MicroVAXes

AppleTalk network:

50 Macintosh Pluses with 1MB RAM, 40MB Apple
hard disks

90 Macintosh SEs with 1MB RAM, 40MB Apple hard
disks

65 Macintosh IIs with 4MB RAM and 80MB Apple
hard disks

81 Macintosh IIX's with 4MB RAM, 150MB Quantum
hard disks

Printers, plotters, scanners:

300 HP LaserJets

425 HP LaserJet Series IIs

10 Apple LaserWriter Pluses

25 Apple LaserWriter NTXs

15 Varityper VT600s

75 NEC Silentwriters

60 IBM LaserPrinters

630 IBM Proprinters

50 QMS laser printers

65 Qume CrystalPrints

3 AGFA Compugraphic 9600s

115 IBM Quietwriter IIs

110 IBM Quietwriter IIIs

620 Epson FX-80s

220 Epson LQ-1500s

170 NEC P-7s, 90 NEC P-9s

110 Panasonic 9-pin printers

40 Okidata wide-carriage 9-pin printers

40 HP plotters

5 HP ScanJet Pluses

5 Howtek Scanmaster scanners

Modems:

759 Hayes modems: 320 1,200 bps, 234 2,400 bps, 205
9,600 bps

532 Racal-Vadic modems: 277 1,200 bps, 202 2,400 bps,
53 9,600 bps

143 Codex modems: 75 1,200 bps, 54 2,400 bps,
14 9,600 bps

140 Case modems: 72 1,200 bps, 50 2,400 bps,
21 9,600 bps

143 AT&T modems: 53 1,200 bps, 76 2,400 bps,
14 9,600 bps

123 U.S. Robotics modems: 64 1,200 bps, 47 2,400 bps,
12 9,600 bps

350 modems from other manufacturers

Add-Ons:

420 3Com, EtherLink II, and EtherLink Plus cards

1,010 Logitech Bus Mice

510 Microsoft Bus Mice

125 internal fax modems



THIRD-PARTY SERVICE: SUMMARY OF FEATURES

	Bell Atlantic Business Systems Services	BusinessLand	ComputerLand	General Electric Computer Service Corp.	IBM National Service Division
GENERAL FEATURES					
Years in business	30	8	14	40	60
Number of field personnel	1,700	703	2,500	1,100	(a)
CONTRACTUAL SERVICES (ON-SITE, CARRY-IN, MAIL-IN)					
Toll-free number available	■	■	■	■	■
Company records customers' problems	■	■	■	■	■
Cancellation/kill requirements	■	□	□	■	□
ON-SITE SERVICE					
Service hours (Mon. through Fri.) (b)	11 hours per day	9 A.M.-5 P.M.	8 A.M.-6 P.M.	8 A.M.-5 P.M.	7 A.M.-7 P.M.
Locations served	All states	All states (c)	All states	All states	All states
Limits service calls per year	□	□	□	□	□
Company has dispatch centers	■	■	■	■	■
Company can assign on-site technician	■	■	■	■	■
Company can provide loaner units	■	■	■	□	□
CARRY-IN SERVICE					
Service hours (Mon. through Fri.) (b)	11 A.M.-5 P.M.	9 A.M.-5 P.M.	8 A.M.-6 P.M.	8 A.M.-5 P.M.	8 A.M.-5 P.M.
Number of locations	200	105	450	22	180
Nationwide locations	■	■	■	■	■
Company can provide loaner units	■	□	□	□	□
Average turnaround time	2 days	2-4 days	3-5 days	10 days	1 day
MAIL-IN SERVICE (e)					
Service hours (Mon. through Fri.) (b)	11 A.M.-5 P.M.	N/A	8 A.M.-6 P.M.	8 A.M.-5 P.M.	8 A.M.-5 P.M.
Number of locations	200	N/A	1	3	180
Company can provide loaner units	■	N/A	□	□	□
Average turnaround time	2 days	N/A	3-5 days	10 days	3 days
TIME AND MATERIALS SERVICE					
Locations served	All states	All states	All states	All states	All states
Minimum charge for labor	Varies	\$105-\$225/hour	\$90/hour	\$108/hour	\$284/hour
Minimum charge for transportation	Varies	None	\$30	\$75 (g)	None
Company can provide loaner units	■	□	□	□	□
HYPOTHETICAL INSTALLATION PRICE QUOTES (h)					
Single-user installation	\$324-\$1,080	\$904	Data not available	Data not available	Data not available
Small installation	\$1,872-\$6,240	4%-12% cost of hardware	Data not available	Data not available	Data not available
Medium installation	\$50,400-\$168,000	\$20K-\$40K for analysis	Data not available	Data not available	Data not available
Large installation*	\$780,000-\$2,592,000	\$10K-\$20K for analysis	Data not available	Data not available	Data not available

■—Yes □—No N/A—Service not available

- (a) Subcontracts non-IBM equipment out
 (b) Hours listed for nationwide companies are relevant for all time zones
 (c) Sites more than 25 miles from a BusinessLand center or branch office are subcontracted out
 (d) Will provide service outside this area for customers headquartered in Northeast
 (e) Mail-in service hours refer to the periods during which you can contact a service technician
 (f) Until 11 P.M. and on weekends for emergencies
 (g) Weekends, holidays, and distances over 25 miles are extra
 (h) Though most vendors provided estimates primarily for their on-site services, mail-in and carry-in services are included in the range of some price quotes

*For a description of the four installations, see the sidebar

"Hypothetically Speaking: Some Typical Installations."

Bell Atlantic Business Systems Services

Bell Atlantic Business Systems Services is the computer service division of Bell Atlantic. Formerly known as Sorbus, when Control Data Corp. was acquired by and merged with it, the company was renamed. It maintains more IBM and DEC systems than any other organization and

also services more than 500 other brands of hardware. Additionally, the company provides service from its European headquarters in Brussels.

In response to our questionnaire, Bell Atlantic indicated that it had a number of on-site service variations. It listed On-Site, On-Site Deferred, Parts Plus, and On-Site Repair Center as standard options. Basic on-site provides a 4-hour response time, 11 hours per day, 5 days a week, with

around-the-clock coverage optional. If a customer owns extra PCs as substitution for those that go down, the deferred on-site plan is quite cost effective; Bell Atlantic will come in and repair all defective computers at once, rather than coming in each time one breaks down. The Repair Center option allows you to have a repair center established on-site.

Bell Atlantic Business Systems Services; 589 Phoenixville Pike, Malvern, PA 19355; (215) 993-6700.

CIRCLE 670 ON READER SERVICE CARD

BusinessLand

BusinessLand is a franchised computer sales company with stores all over the country. Because it is an authorized dealer of IBM, Compaq, and Apple systems,

Idea Servcom Service	Intelogic Trace	NCR Corp.	TouchTech	TRW Customer Services Division
21	5	7	7	13
425	600	5,200	22	1,500
■	■	■	■	■
■	■	■	■	■
□	□	■	■	■
7 A.M.-6 P.M.	8 A.M.-5 P.M.	24 hours	8:30 A.M.-7:30 P.M.	8:30 A.M.-5 P.M.
All states	All states	All states	Northeast (d)	All states
□	□	□	■	□
■	■	■	■	■
■	■	■	■	■
■	■	■	■	■
8 A.M.-5 P.M.	9 A.M.-5 P.M.	9 A.M.-5 P.M.	8:30 A.M.-7:30 P.M.	8:30 A.M.-5 P.M.
14	22	400	1	100
■	■	■	□	■
■	□	■	■	□
10 days	3-5 days	Varies	1 day	3-5 days
8 A.M.-5 P.M.	9 A.M.-5 P.M.	Varies by item	8:30 A.M.-7:30 P.M. (f)	8:30 A.M.-5 P.M.
8	1	100	1	100
■	□	□	■	□
10 days	5 days	Varies	1 day	Varies
All states	All states	All states	Northeast	All states
\$250	\$60-\$135/hour	Varies	\$40/half hour	\$115/hour
\$32	None	None	None	None
■	□	■	□	□
\$701-\$1,029	\$750	Data not available	\$1,110-\$1,387	\$1,050
\$2,467-\$3,795	\$4,727	Data not available	\$4,520-\$5,650	\$5,452
\$73,530-\$77,400	\$71,250	Data not available	\$90,755-\$113,444	\$114,611
\$400K-\$1,128,372	\$984,236	Data not available	\$612,267-\$765,334	Data not available

BusinessLand employees are trained to service these machines.

BusinessLand's response to our questionnaire provided a broad view of its philosophy concerning service relationships. It said it believes that the true cost of service and support over the life of the hardware

will exceed the hardware purchase price by two to three times.

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BusinessLand says it believes that the true cost of service and support over the life of the hardware will exceed the hardware purchase price by two to three times.

ware will exceed the hardware purchase price by two to three times, and that costs can only be reduced by managing all service and support areas—including train-

ing, LAN development and administration, and system obsolescence planning. The single user will pay \$904 in annual charges; there are extra labor charges for on-site software support. We weren't given an exact contract price for the small shop, but it provided a price range of be-

charges for all on-site software support.

We were not given exact prices for the medium and large installations, either. BusinessLand says it would first propose a consulting analysis (for a cost of anywhere from \$10,000 to \$40,000) of the total existing service and support costs for the customer. It would review end-user training programs, phone support, hardware service, LAN maintenance and development. After that, a hardware service contract would be drawn up, with volume discounts applied for the number of systems at single-site locations. Service is performed by BusinessLand for all sites within 25 miles of a BusinessLand center or branch office. Sites exceeding this distance are handled by BusinessLand service subcontractors; BusinessLand says that in these cases, it manages and is totally responsible for activity. In addition, complete phone support with a direct tie-in to on-site dispatching is provided.

BusinessLand, 1001 Ridder Park Dr., San Jose, CA 95131; (408) 437-0400.

CIRCLE 671 ON READER SERVICE CARD

ComputerLand

Like BusinessLand, ComputerLand is a dealer. Companies like IBM, Compaq, and Apple, require third parties to sell their computers in order to become authorized and trained to service them.

We spoke to both ComputerLand Corporate and a ComputerLand franchisee. For nationwide accounts, ComputerLand Corp. offers support through its Unity Program, which coordinates franchisees to provide service for the corporate accounts. For local and regional accounts, service is usually provided by a franchisee.

It should be noted that the answers we received from ComputerLand Corp. and the franchisee were slightly different. For example, the quotes for time and materials costs were considerably higher from ComputerLand Corp. than the prices quoted by the franchisee. If you have an account with a parent corporation like ComputerLand Corp., but will be using the services of a franchisee, try to become familiar with the latter's personnel and organization.

Neither ComputerLand Corp. nor the franchisee would give us price quotes on the hypothetical installations.

ComputerLand, 5964 W. Las Positas Blvd., Pleasanton, CA 94588; (415) 734-4000.

CIRCLE 672 ON READER SERVICE CARD

General Electric Computer Service Corp.

GECS has been in the computer service business almost since the Univac I. It is headquartered in Georgia, with offices all over the U.S. GECS's business focus is computer sales with third-party maintenance, thereby offering "one-stop shopping" for hardware service needs—especially for large, nationwide accounts.

In addition to its maintenance services, GECS also offers upgrades and extensions to existing warranties, liquidation and disposal of used equipment, preventive maintenance, pre-installation cabling, equipment refurbishment and repair (it has over \$100 million worth of spare parts), and rental and lease equipment. GECS can deliver and install its systems fully assembled, tested, and ready to use. It will configure computers, format disks, burn-in systems, and load software at the Region Service Center, then rebox it and ship it to your site. The company says its technicians will even clean up the site after they install the systems and make sure everything is working properly.

The Remote Services Group has two

SERVICE AND RELIABILITY

THIRD-PARTY SERVICE

units that provide on-line or telephone help: the Technical Assistance Center (TAC) gives telephone help from general information and customer education to in-depth troubleshooting on a wide range of PC and peripheral equipment; the Remote Diagnostic Center (RDC) has specialists

IBM National Service Division

IBM offers multiple vendor services, although it may not do the repairs itself. For companies with equipment from many vendors, IBM takes over management of servicing within the parameters that the customer chooses—from negotiating service contracts to coordinating repair and

In addition to its maintenance services, General Electric offers equipment refurbishment and repair (it has over \$100 million worth of spare parts).

who can use telecommunication links to diagnose the problems of mini computer products.

GECS says that its internal policies prevented them from completing the pricing section of our hypothetical installations.

General Electric Computer Service Corp., 6875 Jimmy Carter Blvd., Norcross, GA 30071; (404) 263-5000.

CIRCLE 673 ON READER SERVICE CARD

maintenance. IBM services its own equipment and subcontracts to the non-IBM vendors; payment can be consolidated into periodic invoices. IBM's End User Support program works as a telephone hotline for PCs (IBM, IBM compatible or Apple) with a minimum of 25 workstations installed at any given site. Support service is available 24 hours a day, or from 7 A.M. to 7 P.M. Monday through Friday, de-

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CIRCLE 501 ON READER SERVICE CARD

THIRD-PARTY SERVICE

pending upon customer needs.

**IBM National Service Division, 400
Parsons Pond Dr., Franklin Lakes, NJ
07417; (800) 426-7378.**

CIRCLE 674 ON READER SERVICE CARD

IDEA Servcom

IDEA Servcom emphasized that it is a full-service company. Services like installation/deinstallations/moving, preventive maintenance, shared-risk, inventory management, management reports, system integration, deferred maintenance, burn-in/testing, customer training, and hardware consulting, are all available from IDEA.

Raymond LaBranche, director of Marketing and Sales, provided the most detailed response to our survey. For the single-user setup, two choices were given: on-site (\$1,029) or mail-in/carry-in or MICI (\$701). He recommends on-site since it ensures that the system unit is repaired within 24 hours, or a loaner is provided at no additional charge.

If you have a small shop, you have the same two choices, but with the option of having on-site service billed monthly (\$333.25) or annually (\$3,795.50).

Choosing the latter saves about 5 percent. A mail-in/carry-in option costs \$2,467 per year. All the prices include internal options (memory and graphic cards, etc.). You could also take advantage of Deferred On-

vice, at a monthly fee of \$25 per PC configuration and \$150 for the server. You can also get an On-Site Shared-Risk contract with a prepayment of \$40,000, or an On-Site Time and Material Contract with a prepayment of \$50,000.

For a large installation you can choose

**Services like preventive maintenance,
inventory management, system integration,
customer training, and hardware consulting
are all available from IDEA Servcom.**

Site Maintenance, which responds to a service request after two elements have malfunctioned (keyboard and system unit, for example). There is a 10-percent discount from the regular on-site cost.

For the medium-size installation, you have four choices, with the lowest cost option being MICI Annual Maintenance, at \$19 per PC configuration (including cards, printer, etc.) plus \$150 per month for network server on-site service. The most expensive option is for On-Site Monthly ser-

vice, among other options, full remedial service, including parts and labor, a preventive maintenance schedule specifically designed for the company, and a single toll-free number for your company alone. You can also have a designated national account manager who conducts meetings on a monthly basis to discuss problems, issues quarterly reports on unit reliability, and manages assigned loaners to ensure 100-percent availability. Prices range from Mail-In/Carry-In service for noncritical

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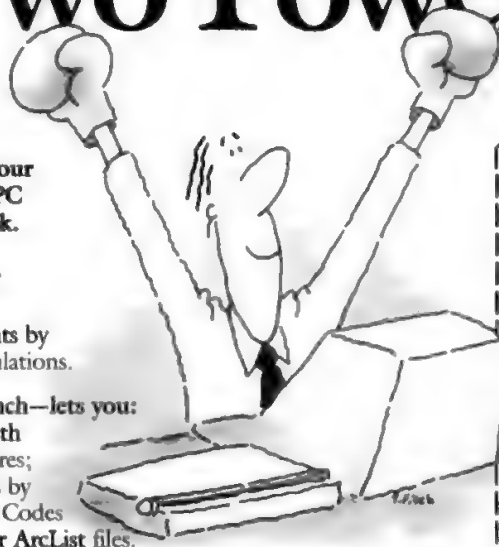
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IDEA Servcom, 1515 W. 14th St., Tempe, AZ 85308; (602) 894-7000.

CIRCLE 675 ON READER SERVICE CARD

Intellogic Trace

Intellogic Trace was formed as a spin-off company from Datapoint Corp.'s customer service division in 1985. It exclusively maintains Datapoint systems. Intellogic is also an authorized warranty service provider for a number of international and domestic manufacturers.

Intellogic's price quotes were based on hardware only. Intellogic is an authorized Novell Support Organization, and thus offers users highly competitive prices for the Novell networks included in the large installation, but did not include them in its quote.

The company said that in locations where a considerable amount of equipment is housed, a dedicated Intellogic field engineer and spare parts would be kept on site. Special pricing might be available, based on more-specific product information and customer requirements.

The company says the TCP/IP network and attached peripherals, DECNet Network, 15 Varityper VT 600s, and the 3 Agfa Compugraphic 9600s would be subcontracted to the manufacturer or appropriate service providers under separate terms, conditions, and pricing.

Intellogic Trace, P.O. Box 400044, San Antonio, TX 78229; (800) 531-7186.

CIRCLE 676 ON READER SERVICE CARD

NCR Corp.

NCR is a national electronics organization that began business with an early point-of-sale system—the cash register. It currently manufactures and services all types of computer equipment: the company's open, Cooperative Computing strategy goes from point-of-sale scanners to PCs to super minis.

NCR filled out our questionnaire, but would not offer price quotes (it did say it is in the same pricing range as its competitors). The company provides multivendor maintenance on most industry standard PC and peripheral products for major users requiring single-source service, and that its pricing is tailored to each customer's individual needs.

NCR Corp., Customer Service Division, 5825 Shelby Oaks Dr., Memphis, TN

38134; (901) 372-4747.

CIRCLE 677 ON READER SERVICE CARD

Touch Tech Inc.

Touch Tech is a regional service provider whose primary market is the Northeast. Its on-site pricing and services are competi-

TTI offers a "bridge" contract that provides incentives for companies to do limited maintenance themselves.

tive with the giants, though its carry-in service is much more limited.

TTI offers a unique "bridge" contract that provides incentives for companies to do limited maintenance themselves, while offering the availability of rapid service response when a serious problem arises. The program works like an insurance policy with a limited number of liability calls. After the number of on-site service calls specified in the bridge contract has been reached, TTI charges on a time-and-materials basis. The fee structure can be very attractive depending on your company's ability to fix its own systems.

Other services include upgrades and trade-ins, data recovery, power/cable testing, telephone and dial-in support, and warranty credit.

In TTI's bid for the medium and large installation, the higher fees are based on TTI's Level A service, which includes one to five technicians at the site(s), depending on its size and whether loaners are needed; Level B service costs 20 percent less than Level A service and has a one-day response time—loaners and on-site technicians are not covered under this service.

Touch Tech Inc., 140 Sylvan Ave., Englewood Cliffs, NJ 07632; (201) 585-2500.

CIRCLE 678 ON READER SERVICE CARD

TRW Customer Services Division

TRW Customer Services Division was created in 1977 when TRW purchased Singer Business Systems, the computer services division of Singer Corp. TRW originally maintained large systems, but is now PC-oriented. It is becoming the largest third-party PC maintainer in the industry.

TRW bid on all the hypothetical instal-

lations except for the largest. For the medium-size installation, TRW says it would need more information regarding the IBM Laser Printers and the internal fax modems to provide a price quote for servicing, so these items were excluded from their quote. TRW decided that since it does not support SUN or Apollo workstations, HP 9000 midrange computers or Compugra-

phic typesetting equipment, its bid on the largest installation would not be fairly comparable to the other companies listed. To give precise quotes, TRW said it required further information about the locations of all the facilities, whether the company has a help desk, and whether any of the sites were large enough to justify and support an on-site management and technical staff team.

TRW Customer Services Division, 15 Law Dr., P.O. Box 2078, Fairfield, NJ 07007-2078; (201) 575-7110.

CIRCLE 679 ON READER SERVICE CARD

CHOOSING A SERVICE

The information found in this article and in the features table is most useful for giving you an overview of the services provided by the vendors, and an idea of the costs associated with some typical installations. This information is certainly not meant to be definitive. To find out exact service costs for your computer installation, you need to research carefully and talk with vendors in your area to get a bid.

Before you talk to the service provider, make sure you've done all the research regarding your system right down to serial number, date of purchase, and photocopies of warranties of all the products you want covered. Also, see if extended-warranty protection is available for any of the products, and what it offers in terms of savings and service provided. Knowing your needs will give you a better understanding of how the various third-party service companies can help you, and exactly what that help will cost.

Christopher Stetson is a technical writer currently working on a book about Microsoft Windows 3.0. Margherita McBean is a New York-based free-lance writer and computer consultant.

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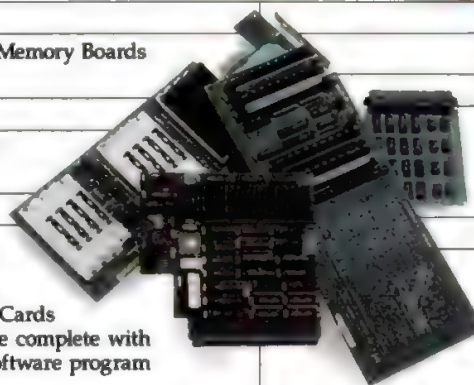
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CIRCLE 370 ON READER SERVICE CARD

by
Alfred Poor

Lab Notes

When you upgraded to your 386 system—in fact or in fancy—you probably opted for a 20-MHz rather than a 16-MHz CPU, for an ESDI rather than an ST-506 controlled hard disk, and for a 16-bit rather than an 8-bit VGA card. True or false: All three of these choices will make your system run faster.

False. Unfortunately, while you've paid for the speed of 16-bit video, you're likely to be getting only 8-bit performance. And the worst of it is that you may not realize you have a problem.

How can this be? I'll get to the technical explanation in a moment, but simply put, the problem is a consequence of most 16-bit VGA cards having what is often called an *auto-sensing* feature. With auto-sensing, a card is *supposed* to be able to tell whether it is installed in an 8-bit or 16-bit slot and can configure itself to run in 8-bit or 16-bit mode accordingly.

The trouble arises when the VGA card is installed in a 16-bit slot and there are other cards in the system. Sometimes a VGA card "sees" these other cards and decides that it cannot run in 16-bit mode, so it automatically steps down to 8-bit. And it never bothers telling you.

This article will cover several facets of this video slowdown. First, I will discuss some of the technical reasons for the problem—reasons that involve signals on the AT bus and memory addresses. Next, I'll show you some of the ways you can detect whether or not your system is suffering from this automatic slowdown. Finally, I'll take a look at just how significant the problem is and whether or not you really need to be concerned.

BOARDING THE BUS

The first part of the story starts with the design of the original PC. It was the first personal computer with a 16-bit processor to gain wide popularity for business applications, but it had only an 8-bit data path. The original PC bus had eight data lines, and so could handle data only 8 bits at a time. As a result, the original PC expansion

Facing the Truth About 16-bit VGA Display Adapters

■ Your 16-bit VGA display adapter may be running at an 8-bit pace without your knowing it.

sion bus offered only eight data lines.

In addition to data lines, a computer also needs a way to access its memory; for this you need address signals so that you can specify exactly which part of memory you wish to access. Eight bits can represent only 256 (2 to the eighth power) different possible values, and this was not a large enough number of memory addresses. The basic unit within the CPU was the 16-bit word, a 2-byte value that could represent 65,536 (64K) different values. But this was still not enough. So the original PC was designed to use 20-bit addresses, a number of bits that could uniquely identify just over 1 million (1,048,576) possible memory addresses or locations. Twenty-bit addresses have a peculiar segment:offset scheme. Both the segment and the offset are 16-bit quantities. To get the actual linear 20-bit address from a segment:offset pair, you multiply the segment by 16 and add the offset. As a result, the original PC expansion bus had 8 lines for data and 20 lines for memory addresses.

In the world of that day, when 64K and 128K were the accepted limits of computer memory, 1,024K seemed like a nearly infinite amount. It was so much memory, indeed, that the original designers reserved the top 384K for the system BIOS, display

memory, and other uses, and limited the operating system and its applications to the first 640K. That's a limitation we've been struggling with ever since.

The limitations soon became apparent and the AT was born. The original PC, with its 8088 CPU, had only 8 data lines on the bus. The 80286 CPU of the AT, with its true 16-bit processor and a 16-bit data path, demanded a wider bus—one that would accommodate the transfer of 16 bits at a time. With a view to the future, it needed a larger addressable memory, as well. But to keep old and new users happy, the AT's designers wanted to maintain compatibility with the 8-bit bus. The solution was to tack another section of edge connector socket, shown in Figure 1, onto the motherboard and to design cards that would work in either the original 8-bit or the extended 16-bit slot.

The bus extension provided the 8 additional data lines needed to bring the total number to 16, thus matching the 80286's capabilities. It also provided four additional address lines, which enabled the AT to address a mind-boggling 16MB of memory. (In today's world of OS/2 and Windows 3, of course, 16MB, while ample, no longer numbs the mind.)

But how was the CPU going to talk to this new part of the bus, and how could expansion cards let the CPU know when to send 8-bit data to maintain compatibility with older cards and when to send 16-bit data to take advantage of the new capabilities of new designs?

The answer took the form of having the CPU send out a private message for 16-bit

Lab Notes

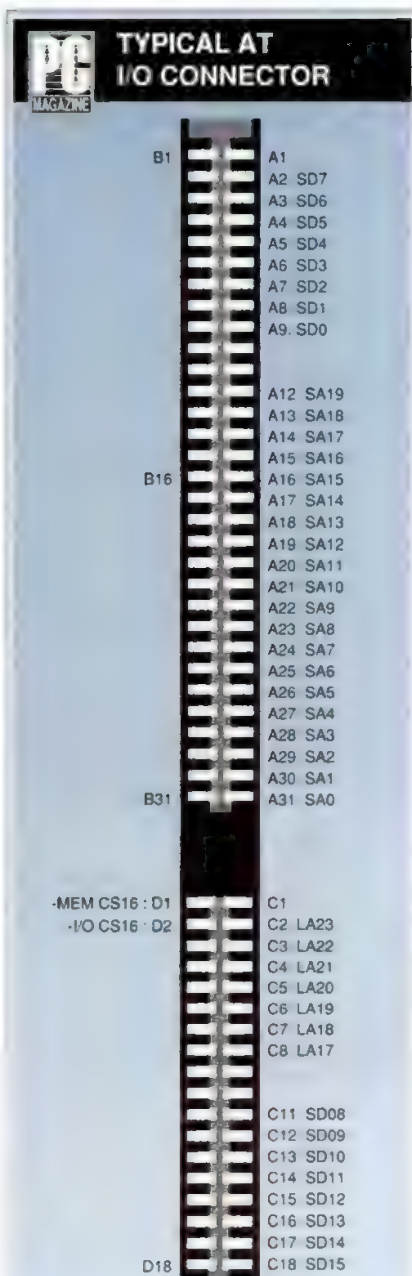


Figure 1: To get a wider bus while maintaining compatibility with the original 8-bit slot, the AT designers decided to tack on another section of edge connector.

cards in advance of sending data along the bus. By sending out the high part of the target address first, the 16-bit cards in the system could be alerted as to where the instructions were headed. This advance warning would be sent along the new address lines on the extended bus. The diffi-

culty with this solution was that the four new lines could tell the cards only which megabyte (out of the 16 possible) was to be the destination. Since most of the cards would probably be occupying lower portions of the memory map, this clearly did not provide enough information.

The answer was to *duplicate* some of the lower address lines—specifically the top three—from the original bus. By this I mean that the signal on these three new lines is the same as the signal on the corresponding lines in the original part of the slot. In this way, the advance warning can tell the cards on the 16-bit bus when a message is headed for an address within a 128K segment of memory. When a card decides that a message is intended for it—because it resides in that specific segment—the card puts a signal on MEM CS-16 on the extended bus. This signal triggers a 16-bit transfer by the CPU. On the other hand, if the card decides that the message is intended for an address outside its 128K segment, it leaves everything alone. In the *absence* of a signal on MEM CS-16, the CPU knows to send the message in 8-bit pieces instead.

Unfortunately, this arrangement promised to be more adequate than it has proved. For one thing, the designers did not take into account our unquenchable thirst for speed and our insatiable appetite for variety in the option cards we insist on cramming into our expansion slots. In their search for ways to get a performance edge on the original IBM AT, clone manufacturers began running their CPUs faster and faster. Since it was simpler just to let the expansion bus run at the same speed as the CPU, 10-MHz and 12-MHz AT clones started running their buses faster. And users started running into problems.

Among the problems associated with running the extended AT bus faster than 8 MHz, one is particularly germane to this discussion of 16-bit VGA cards. While there was general agreement that the extended bus would get advance notice about the memory segment targeted for a transfer, *there was no specification governing the amount of time that could elapse between the early warning and the actual transfer.* As a result, when confronted with higher bus speeds, some cards simply took too long in requesting 16-bit transfers, and then would get confused when the data came through in 8-bit words.

Fortunately, the bus-speed problem has diminished in practical importance because most manufacturers have become

careful to run their bus slots at a standard 8 MHz. The few that run faster typically give you the option of slowing one or all of the slots down to the 8-MHz speed.

ROM WITH NO VIEW

A second, less tractable problem that causes difficulties for 16-bit VGA cards is more intimately related to the design of the extended bus. The purpose of the early warning is to let the 16-bit cards know the address segment toward which the next transfer on the bus is headed. A video card may be addressed in either of two areas: video RAM, where data for images is written and buffered, or video ROM, which contains BIOS routines for display operations. The early warning indicates which 128K segment is targeted.

The problem is that 128K is a fairly big segment.

A look at the memory map in Figure 2 indicates that the segments from 0000 to 9FFF are assigned to system memory. That's the familiar 640K section that we

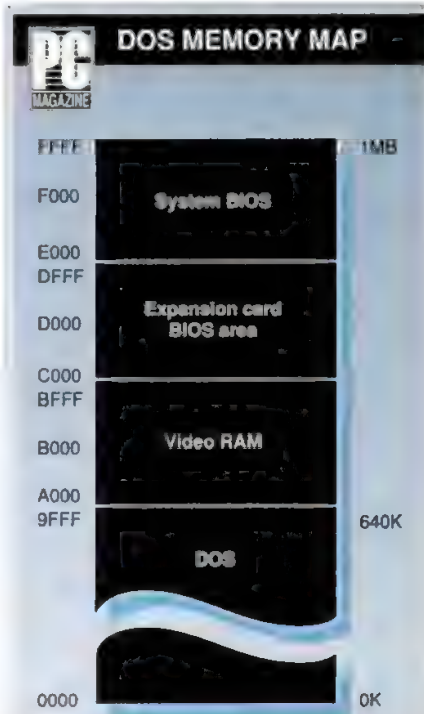


Figure 2: ROM for both 8- and 16-bit expansion cards is mapped into the same memory segment, C000 through DFFF. Since the early-warning system cannot be specific within this 128K area, if a 16-bit card is in this region, it may trigger a 16-bit transfer. This is fine if indeed the message is intended for the 16-bit card. But if it's destined for the 8-bit card, it could arrive scrambled.

Lab Notes

have all come to know and love . . . well, at least know. The segment from A000 through BFFF is reserved for the various display adapter image buffers, or in other words, for the video RAM. The system BIOS rules over the segments E000 through FFFF.

That leaves the area from C000 through DFFF as space in which to map the ROM for all manner of expansion cards: disk controllers, video adapters, local area network cards, and so on. These ROMs contain the needed program code used by drivers and the operating system to work with the various expansion cards.

The range from C000 through DFFF is exactly 128K. And as we've just seen, in letting cards know where an upcoming instruction is headed, the early warning system cannot be more specific than to indicate that the destination is somewhere within a given 128K segment.

Thus, if a 16-bit card has its ROM BIOS mapped into this region, it will trigger the signal for a 16-bit transfer if it is

warned that the message is headed *anywhere* within the 128K space between C000 and DFFF. This is fine if the message is in fact intended for that (or another) 16-bit card. But what if the intended recipient happens to be a poor 8-bit card that is *also* mapped into a portion of the same segment? If the CPU sees a MEM CS-16 signal and sends the message 16-bits wide, the 8-bit card can't possibly handle it correctly; the card has only half the data lines needed for a 16-bit message. So the 8-bit card gets a scrambled message and then something goes wrong. In extreme cases, the system crashes.

You should note that the same problem can arise in the video buffer region, which is between A000 and BFFF. This is less likely to occur in practice, since few people put two video adapters in their PCs, and it is rare that one would be 8-bit and the other 16-bit. But nonetheless it occasionally does happen.

In some cases of conflict within the C000 to DFFF region, some cards simply won't start. In the PC Labs tests I discuss in a moment, we found one card that would not even let an Intel AboveBoard start when both were installed in 16-bit

slots. The IBM PC AT in which they were both installed simply could not see the memory on the AboveBoard at all.

In other cases, however, the effect may be more subtle. During the power-on tests, when the 16-bit VGA card determines that there are other cards mapped into the same memory region, it may decide on its own that the system would be better off if it behaved as an 8-bit card instead.

If your 16-bit video adapter card gives you system problems, one simple, if draconian, solution is simply to put it in an 8-bit slot. This obviously seems to entail forgoing half the video system performance you've paid for, just to get things running. But there is, in fact, a *question* about just how much real performance you are losing. The answer to this question is important, even if you're having no system problems, since it forms the basis for deciding whether your 16-bit card in a 16-bit slot is actually performing as a 16-bit device or an 8-bit one.

RUNNING THE NUMBERS

To explore the dimensions of the 16-bit VGA problem, we ran a series of tests in PC Labs. In the first set, we took three 16-

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InfoWorld, May 22, 1989



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PC Week, May 1990



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bit VGA cards and ran them in an 8-MHz IBM AT. We ran a series of video speed tests with each card, first mounting it in a 16-bit slot and then in an 8-bit slot. To check for conflicts with other 16-bit cards, we ran each test with an Intel AboveBoard installed and then with it removed.

We used a comprehensive suite of test programs developed for PC Labs by Spirit of Performance, Harvard, Massachusetts. The tests put the VGA card through a variety of video operations in both text and graphics modes. It also tests speeds both when a program uses the video card's BIOS and when the program writes directly to the card's registers without going through the BIOS.

When mounted in a 16-bit slot, each of the three VGA cards turned in nearly identical times, whether or not the AboveBoard was also installed. Installation of the AboveBoard thus did not cause any of the VGA cards to step down to 8-bit operation. As mentioned earlier, however, one card prevented the AboveBoard from starting at all or being recognized by the computer. While this itself did not affect the VGA card's performance, it presented an overall performance situation that most users would find unacceptable.

Perhaps an even more important result can be seen by comparing the 16-bit and 8-bit results. In nearly every graphics mode test there was essentially no difference between the 16-bit and 8-bit times. In text mode, moreover, the test times for direct video write were also identical for 16-bit and 8-bit modes. This is because the test program could write to the screen only in 8-bit mode; like many real-world applications, our test programs were not able to generate a 16-bit mode write to the video.

The main speed differences observed were related to BIOS test times. This is not surprising. It is the ROM BIOS on the card that is accessed either in 16-bit or in 8-bit mode, and since ROMs are so much slower than RAM, it makes sense that reading in twice as much at a time is much faster, as it gets the task completed in fewer steps. Both in text and graphics modes, the scrolled and unscrolled BIOS write tests were much faster in 16-bit mode than in 8-bit. The scrolled BIOS write in graphics mode was about 50 percent faster in 16-bit mode than in 8-bit mode, and the other three tests (the unscrolled BIOS write in

graphics mode, and both BIOS writes in text mode) were twice as fast in 16-bit as in 8-bit.

The only other test that showed a significant difference was the Move Full Screen test in text mode. The program ran this operation twice: first using 8-bit transfers and then using 16-bit transfers. The 8-bit moves were the same no matter which slot the VGA card was installed in. The 16-bit moves were nearly twice as fast when the card was in a 16-bit slot as when it was in an 8-bit slot. These results were confirmed by the PC Labs Benchmark Series, Release 5.1, video speed tests.

If you have an AT-class machine, then, the easiest way to test your card to determine just how it is operating is to run a BIOS write speed test with the card in a 16-bit slot, then in an 8-bit slot. If you don't see a difference, then your card has been operating at 8-bits, not 16.

However, when you have a VGA card installed in an AT-class machine, you will not see any performance difference between 16-bit and 8-bit modes *unless* you are going through the card's BIOS or are using a program that can generate 16-bit writes to the video. Looking at the matter realistically, relatively few application programs go through the BIOS (if you have to configure your application for your adapter, then it likely skips the BIOS); most write directly to the card's registers. Moreover, many graphics drivers, such as the *Microsoft Windows* VGA driver, write to the video only in 8-bit mode.

RUNNING IN THE SHADOWS

What if you have a 386-based computer? It turns out that the issue of BIOS performance takes on a different dimension with these machines.

Computers based on 386 chips typically have a feature that allows you to shadow the BIOS. This simply means that the computer copies the contents of the slower BIOS ROM chips into a section of fast, 32-bit motherboard memory. A 32-bit processor has 32 data lines instead of 8 or 16, but there are still only 24 address lines. These designs use the 384K in the first megabyte of RAM that comes after the 640K system memory. Most machines that do this will shadow both the computer's system BIOS and the video BIOS.

To test the effects of shadowing, we ran the same test suite on a clone 386 with a 16-bit VGA card. We ran the tests with the card in an 8-bit slot and then in a 16-bit slot; in each case, we ran the tests with the

BIOS shadowing turned on and off.

The results may be surprising. Without shadowing, the BIOS operations were a little faster in a 16-bit slot than an 8-bit, but the differences were hardly so dramatic as those we had seen in the AT tests. With shadowing on, however, the times were two to nearly ten times faster than without shadowing, and the speeds were nearly the same for 8-bit and 16-bit slot operation.

The two-to-ten-times result may sound impressive, but recall that few programs actually use video BIOS routines. The shadowing really does little for you, aside from making your DOS screens scroll by too fast to read and turning in low times on benchmark tests.

The only other significant differences were that 16-bit operation was faster for the 16-bit text-mode full-screen move tests and for the graphics-mode fill tests. All other tests produced the same results, whether the card was in an 8-bit or a 16-bit slot and whether the ROM BIOS shadowing was turned on or off.

CONCLUSIONS

If you have a 16-bit VGA card that is causing conflicts with other cards, you can move it to an 8-bit slot without having to worry too much about losing performance. If you have an AT-class machine, the card will run slower for BIOS operations, but since most applications write directly to the hardware, this is not a serious factor. The most significant performance loss you will experience will occur if you are using a graphics program capable of 16-bit video writes.

If you have a 386 computer with ROM BIOS shadowing, the shadowing is a more important factor for video BIOS performance than whether the card is in an 8-bit or 16-bit slot. However, keep in mind that few programs rely on the video BIOS at all, so you may be able to put that memory to better use. On a 386, the 16-bit slot will probably give better performance for some graphics operations, but it is not a difference you are likely to notice for most applications.

In fact, as long as your video card is running properly in a 16-bit slot and you do not get conflicts with other 16-bit cards (such as the problem with the AboveBoard with one of our test cards), you can be fairly certain that you are getting as good a performance out of it as you can expect. ■

Alfred Poor is a contributing editor of PC Magazine.

by
Ashok P. Nadkarni

Utilities

How often do you wish DOS would let you correct a typo without making you rekey the whole line? Or switch both a drive and its directory in one step instead of two? Or reissue a series of commands without re-typing each one of them separately?

PC Magazine's CMDEDIT utility provides these and many more keystroke-saving enhancements to the DOS command-line interface. It also adds these features to other programs (DEBUG and EDLIN, for example) that get their user input using DOS function 0Ah, Buffered Keyboard Input. Such CMDEDIT features as command-line stacking, autocompletion of command lines, full line editing, programmable function keys, program macros with variables, filename expansion, and drive/directory stacking will save you countless keystrokes in your interactions with DOS.

You can download a ready-to-run copy of CMDEDIT.COM from PC MagNet by following the instructions given in the sidebar "CMDEDIT by Modem." Or you can download CMDEDIT.BAS from PC MagNet and run that program once in BASIC to create the .COM file. To study the code and assemble the program for yourself (you'll need Version 2 or later of an IBM or Microsoft macro assembler), you should download the archive file containing the files listed in Figure 1. Running MAKECMD.BAT included there will ensure that the files are assembled and linked in the proper order. If you don't have a modem, you can get a printout of the assembly or BASIC listings by mail or fax by sending a postcard with your name and address (or fax number) to Utilities, PC Magazine, One Park Avenue, New York, NY 10016; Attention: Katherine West. (Note: the estimated fax length is 40 pages.) No phone calls, please.

CMDEDIT is a terminate-and-stay-resident (TSR) utility. Unlike many programs that you activate with a hotkey, CMDEDIT simply sits in memory and manages buffered keyboard input. CMDEDIT is written in assembly language and takes up

CMDEDIT: The PC Magazine DOS Command-Line Editor

■ Whatever your level of expertise, this utility offers you a host of ways to make your interface with the DOS prompt more efficient.

about 7.5K of memory space plus the data buffer size (about 1 to 1.5K is usually more than enough) specified by the user.

Although you can load it from the DOS

prompt, normal installation is by means of a line in your AUTOEXEC.BAT file. The full CMDEDIT syntax is

```
CMDEDIT [/x] [/i] [/g] [/px]
[/dnnn] [/mnnn] [/bnnn] [/nnnn]
[/filename] [/u]
```

All CMDEDIT parameters are optional and can be selected after you've loaded the program. Since CMDEDIT can detect itself in memory, it will interpret a subsequent selection as a message to change the option. Entering invalid options or values will cause the installation to abort with an error message.

Although a full understanding of the operation of several of the optional parameters shown above requires the section-by-section explanation of CMDEDIT's features given below, an initial summary presentation may be helpful.

■ The /r parameter toggles the auto-recall mode of the command-history feature discussed below. By default, this mode is inactive when CMDEDIT is loaded.

■ The /i parameter instructs CMDEDIT to use insert mode for user-typed characters during line editing; overwrite mode acts as the default. The active setting can be toggled on a line-by-line basis with the keypad INS key.

■ Supplying the /g parameter installs CMDEDIT in silent mode. By default, the program beeps on certain errors, such as trying to scroll beyond the first or last line of the command-history buffer. Once CMDEDIT is installed, this parameter acts as a toggle.

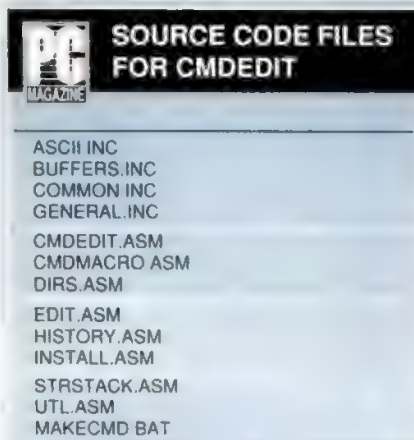


Figure 1: In addition to CMDEDIT.COM and CMDEDIT.BAS, these assembly language files are archived in a single file and are available on PC MagNet for downloading. The MAKECMD.BAT file takes care of all the steps needed to create CMDEDIT.COM; you need supply only the macro assembler.

Utilities

- The /p option can be used to select a character (the default is ;) whose presence at the start of a line prevents CMDEDIT from automatic symbol or macro expansion on that line. (CMDEDIT's use of symbols and macros will be discussed below.)
- The /d parameter lets you increase or decrease the memory space CMDEDIT reserves to store previously executed command lines. The 512-byte default is usually sufficient. But if you want to change this number to 1,000 bytes, you would enter /d1000 as a parameter when loading CMDEDIT.
- The /m and /b options specify the amounts of memory reserved for macro definitions and for symbol definitions, respectively. The default is 512 bytes for each. Note that the symbol buffer includes the definitions for function keys and symbols (see below).
- The /s option sets the amount of memo-

ry reserved for the directory stack. The default is 128 bytes.

- The option /filename lets you specify the name of a file to be read into CMDEDIT at initialization time. This file should contain any macros and symbol definitions you use every day. Instructions on generating such a file are given in the sidebar "Preparing an Initialization File."
- The final option, /u, lets you uninstall CMDEDIT. It's important to remember that TSRs are memory-resident programs and should be uninstalled in the opposite order in which they were installed (that is, the last one installed should be the first one uninstalled).

SYMBOL DEFINITIONS

The CMDEDIT symbol-definition facility lets you abbreviate often-used commands. When CMDEDIT finds a previously defined symbol at the start of a command line, it replaces the symbol with its established value. The rest of the command line is not changed.

Symbols are defined with the DEFS

command using the following syntax:

```
defn symbol-name replacement-  
string
```

The *symbol-name* is arbitrary and has a maximum length of 254 characters. The *replacement-string* is separated from it by one or more space or tab characters. You might, for example, define the symbol `ed` by entering the CMDEDIT command

```
defn ed c:\wordproc\edit
```

at the DOS prompt. If you then later enter

```
ed letter.doc
```

DOS will execute the following command:

```
c:\wordproc\edit letter.doc
```

Before passing a command line to the calling program (usually COMMAND.COM), CMDEDIT examines the *first* word on the command line to see whether

PREPARING AN INITIALIZATION FILE

by Ashok P. Nadkarni

As indicated in the CMDEDIT syntax, the /f option allows you to specify the name of a file to be read in as CMDEDIT commands at initialization time. This file should contain the macro and symbol definitions that you use every day. It may also contain the CMDEDIT commands `PUSHD`, `POPD`, and `CHD`. Note, however, that the file must *not* contain any other commands or CMDEDIT will display an error message and abort.

The format of the commands in the initialization file is the same as if you typed them in from the keyboard. You may separate different macro and symbol definitions by blank lines. Of course if a blank line or a comment line appears inside a macro definition, it will be treated as part of the definition.

In an initialization file (only) you can also start a line with a - (hyphen) character to indicate that it is a comment. This must be the very first character on the line (no tabs or spaces). CMDEDIT will simply ignore any such line.

Instead of typing in all your macro

and symbol definitions with a text editor, you can create them as and when needed, directly on the command line and then write all of them out to a disk file that you can use as your initialization file. To do this, use `DEBUG`, the `CMDSTAT` command, and the following CMDEDIT macro:

```
defm cmddump  
debug > %1  
cmdstat  
%1  
endm
```

I chose `DEBUG` because it adds little to the output. It's also a program that many of you already have, and it uses the DOS Buffered Keyboard Input Service. In this macro the output of the `DEBUG` program is redirected to a file whose name you specify as the first parameter of the macro. With the macro defined, entering

```
cmddump cmddedit.mac
```

will write out all the current macro definitions to the file `CMDEDIT.MAC`.

This file can then be used with the -f parameter to load definitions into CMDEDIT at the time it is loaded into memory. If you use this `CMDSTAT` procedure, however, any comments will be lost when the symbols and macros are written out to the file.

Following is a short example of what an initialization file looks like. Your own initialization file will likely contain many more definitions.

```
defn d dir /w  
defn up cd ..  
defn masm c:\language\masm5.0  
\masm /Ic c:\language\masm5.0\inc  
defn ed c:\wp\edit  
defm home  
chd c:\  
endm home
```

You should note that the `ENDM` command here is followed by the name of the macro that the line terminates. CMDEDIT ignores all remaining characters on a line whose first word is `ENDM`. This is thus a convenient way of matching `DEFM` and `ENDM` commands in long macros. ■

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it has been defined as a symbol. If so, the symbol is replaced by its expansion (replacement) string. This procedure is done recursively. In other words, after the symbol is replaced by its definition, the new line is scanned again to check if the first word is a symbol. If so, *that* symbol is replaced in turn, and the whole procedure is repeated. Suppose, for example, that you define the following two symbols:

```
defa d dir
defa dc d c:
```

If you now type

```
dc
```

CMDEDIT will expand the line to

```
d c:
```

But since *d* itself has been defined as a symbol, the line will be further expanded to the following:

```
dir c:
```

This will then be passed to DOS, since *dir* is not defined as a symbol. So you should be careful not to define a symbol in terms of itself, as it will put CMDEDIT into a loop. If this happens, press Ctrl-Break.

If you want to temporarily use the symbol literally, that is, to prevent its replacement by the defined *string*, put a ; character at the beginning of the line. (This semicolon must not be preceded even by white space). CMDEDIT will remove the semicolon, move the rest of the line up by one character and then process or pass the line back to the application without expanding any symbols or macros. Should you want to use some character other than the semicolon for this purpose, you can do so by invoking the /p option at start-up.

CMDEDIT symbols may be deleted with the DELS command, which has the following syntax:

```
DELS symbol1 symbol2...symbolN
```

where *symbol1*, *symbol2*, . . . *symbolN* are the names of the symbols you wish to delete. If a particular symbol name does not exist, CMDEDIT will simply ignore it and go on to the next name.

The DELS command is useful for recovering symbol buffer space when a symbol is no longer needed. Note that DELS removes only the *latest* (the current) definition of a given symbol; deleting it may thus reactivate a previous definition for a symbol. If the same symbol name has been redefined a number of times, you will have to use its name that many times in the DELS command to remove them all.

The RSTSYM (Reset Symbol) command clears and resets the entire symbol buffer. It is the first of several Reset commands we'll mention. If this strikes you as unusual, you're right. Generally, when you enter a command at the DOS prompt,

CMDEDIT replaces the rudimentary DOS command-line editing facilities with its own keypad and Ctrl-key commands.

it either activates an internal DOS command or runs a program. However, since CMDEDIT handles all buffered keyboard input, it passes along what you've typed and first checks whether it's a CMDEDIT command word (such as DEFS or RSTHIST). If it is, it "swallows" the command and executes it.

USING CMDEDIT

CMDEDIT replaces the rudimentary DOS command-line editing facilities with its own set of keypad and Ctrl-key commands; these are listed and explained in Figure 2. Function keys F1 through F10 and their shifted versions can be programmed to execute commands or to insert character sequences on the command line. These function-key definitions are effective only when you are at the DOS prompt with CMDEDIT installed. In addition, these definitions will not be activated when you use these function keys in your regular applications; they will work as they always have worked. However, if you use a program that receives input from the DOS Buffered Keyboard Input service, then the function-key redefinitions will

take effect. DEBUG is such a program.

Function keys are assigned definitions with the CMDEDIT DEFS command. As explained above, this is a special-case use of the DEFS command. In this application the symbols F1, F2, up to F0 (for F10), correspond to the function keys; the shifted versions of these keys are defined using symbols SF1 to SF0.

You might program the F1 key thus:

```
defa f1 dir
```

Thereafter, when you hit F1, CMDEDIT will insert the *string*—in this case, *dir*—onto the command line. Moreover, if the last character in the string is @, when the key is expanded, the @ is replaced with a carriage return and the line is executed as a command. (Note: This does not work with non-function-key symbols.) Thus, if you define the symbol F1 as

```
defa f1 dir@
```

you'll immediately get a listing of your current directory when you hit F1.

Lines directly executed through such function-key definitions are not stored in the command-history buffer, since it is as easy to hit the function key again as to recall the command from a stack. Note that function keys always insert strings onto the command line, even in overwrite mode; the line is not cleared before the insertion. This makes it possible to add successive strings to the same command line by assigning them to different function keys.

There are probably certain function-key definitions you will wish to use every day and that you would like to have loaded along with CMDEDIT. These can be placed in an initialization file specified with the /f parameter, as described in the sidebar "Preparing an Initialization File."

THE COMMAND HISTORY

CMDEDIT maintains a list of the commands you enter in a special command-history buffer. Whenever you execute a command by hitting Enter, CMDEDIT puts a copy of the command line at the front of this list.

You can move back and forth through CMDEDIT's history buffer. Press the Up Arrow key (or Ctrl-U) and the previously executed command will appear on the command line; you can edit or execute it as if you had just typed it in. You can freely intermix any number of CMDEDIT edit-

COMMAND-LINE EDITING COMMANDS

Key(s)	Action
Ctrl-F or Right Arrow	Moves the cursor forward to the next character on the line.
Ctrl-B or Left Arrow	Moves the cursor back to the previous character on the line.
Ctrl-Right Arrow	Moves the cursor forward to the first character of the next word on the line.
Ctrl-Left Arrow	Moves the cursor forward to the first character of the previous word on the line.
Ctrl-E or End	Moves the cursor to the end of the line.
Ctrl-A or Home	Moves the cursor to the first character on the line.
Ctrl-D or Del	Deletes the character at the cursor.
Ctrl-H or Backspace	Deletes the character before the cursor.
Ctrl-W	Deletes the word to the right of the cursor.
Ctrl-L	Deletes the word to the left of the cursor.
Ctrl- or Esc	Erases the entire line.
Ctrl-K	Deletes all characters from the cursor to the end of the line.
Ctrl-X	Deletes all characters preceding the cursor on the line.
Ctrl-O	Deletes all characters from the cursor to the end of the line and then executes the line. This command is particularly useful in auto-recall mode.
Ctrl-G	Erases the command line but keeps it in the history buffer for later recall. This is useful when you type in a long command and then remember you must first execute a different command. Hit Ctrl-G to store the already-typed line, execute the proper command, and then recall the stored line from the history buffer.
Ctrl-E	Executes a line, erases it from the screen, and does not store it in the history buffer. This is useful when using a network password you do not wish others to see. Note that ^^ is displayed by holding down the Ctrl key and hitting 6.
Ins	Toggles between insert and overstrike (default) mode when you're entering characters on the current line. CMDEDIT will display a line cursor in overstrike mode and a block cursor while in insert mode.
Ctrl-I or Tab	Examines the word to the left of the cursor and tries to complete it as a filename. The word may contain a full disk and path specification. If several files match, only the common part of their names will be placed on the command line. If no names match, the word is erased. If the matching name is a directory, then a \ character is added, making it easier to enter a complete path specification. If the matching name is not a directory, then a space is placed after the name. Note that if you use the Expand-Filename facility to expand a directory name and then immediately issue a DOS CD command, an error will result because of the trailing \ character. You can either delete the added \ or use CMDEDIT's own directory commands (PUSHD, POPD, and CHD), as described in the text. These not only accept the trailing \ but also permit you to specify the disk together with the directory name.
Ctrl-J	Causes CMDEDIT to look in the command line for any CMDEDIT or DOS environment variables and to replace them with their string values. Use of variables is explained in the article text.
Ctrl-Q	CMDEDIT treats most control characters as commands. To place a control character on the command line, precede it immediately with Ctrl-Q. This will prevent CMDEDIT from treating it as a command. For example, if you type Ctrl-Q Ctrl-A, a single Ctrl-A character @ will be put on the command line.
Ctrl-Z	Typing Ctrl-Z places a ^Z (the DOS end-of-file marker) on the command line.

Figure 2: CMDEDIT uses these keys for command-line editing.

ing and history recall keys. Similarly, the Down Arrow key (or Ctrl-N) moves the current history line pointer forward to the next (more recent) line in the buffer and puts that command on the command line. If you try to move past either end of the history list, CMDEDIT will beep.

Note that CMDEDIT minimizes memory usage by storing only a single copy of every command line, even if it is executed several times. When you reexecute a command, its entry is moved to the front of the history buffer list.

If you've issued a large number of commands during a session, of course, scrolling back through the history list could take longer than reentering the command. To speed your search among previously issued commands, therefore, CMDEDIT lets you enter one or two characters (any

number will do, but the fewer you have to use, the better) and then search the buffer for the command line that begins with those characters. Ctrl-R searches backward, successively placing each matching older command on the command line. Ctrl-V searches forward for command lines that begin with the character(s) you have entered. In both cases the cursor position is left unchanged, and again, you can edit the command line presented before executing it. Note that the search begins from the line *before* or *after* the current history line: CMDEDIT excludes the current line even if it matches. This allows you to use the search functions repeatedly to move rapidly forward and backward through the history list when several lines match the characters in front of the cursor.

Going through the command stack (the

history buffer) with Ctrl-U (Up Arrow) and Ctrl-N (Down Arrow) can be likened to conducting a manual search. The Ctrl-R and Ctrl-V procedure is semiautomatic: you still have to know in which direction to search, and you may not know how many initial letters you need to type in before you get a complete match with the command you want. By using CMDEDIT with its /r option set, however, you can put the program into its fully automatic, auto-recall mode.

In auto-recall mode, when you start typing a new line, CMDEDIT will try to complete it for you by looking through its command history for a line that begins with the characters you have typed in. If you keep typing, CMDEDIT will keep on replacing the current line with the most recent line from the history buffer that

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matches the characters typed up to that point.

When the line displays the command you want to execute, all you do is hit Enter. As you type on, however, it may happen that there is no matching line in the command history. In this case, the command line is automatically cleared from the cursor to the end of the line, erasing any characters that may have been present because of a previous partial match. Alternatively, you can use any of the CMDEDIT command keys to edit the line or scroll/search through the history buffer, as described above. In any event, you end up typing as few characters as possible to enter the desired command line.

There are a few other things you should know about auto-recall mode. Using any CMDEDIT command key turns auto-recall off for that line; otherwise, you couldn't edit the line normally. Similarly, if there is no matching line, auto-recall mode is turned off for that line. It remains deactivated until you hit Enter to execute the current command. Auto-recall then becomes active again for the next command line. Note that once it's disabled for a line, auto-recall remains disabled, even if you edit the line to match one that is in the history buffer.

Auto-recall mode is automatic, but it is not intuitive: it can't read your mind. Suppose that you wish to execute a program with the short name `d`, and it happens that the history buffer currently contains the line `dir *.c`. In this case, when you type `d`, the auto-recall mechanism will put `dir *.c` on the current command line. If you were simply to hit Enter after typing `d`, you'd end up executing `dir *.c` instead. The solution in such a case is to hit Ctrl-K after typing `d`. Ctrl-K deletes the remainder of the line (in this case, the unwanted `*.c`). You can then hit Enter to execute the `d` command, as desired.

It is important to keep this in mind in auto-recall mode. If the command in the buffer happened to be `del *.c` instead of `dir *.c`, forgetting to use Ctrl-K before hitting Enter could be a serious matter. Because this situation is not uncommon, CMDEDIT provides a special shortcut. If you hit Ctrl-O at any point, all characters after the cursor will be erased *and* the line will then be executed. In other words Ctrl-O is the equivalent to hitting Ctrl-K fol-

lowed immediately by Enter. If you use the auto-recall mode, therefore—and it's so convenient that it is quickly habit-forming!—it's a good idea also to make a habit of using Ctrl-O instead of Enter to execute short commands.

If you do not include the `/r` option when you initially install CMDEDIT, and instead select it later, note that it takes effect only *after* the *current* input line has been executed.

Unlike DOS's CD command, CMDEDIT lets you specify a drive and directory.

If at any point you want to clear the history buffer of its entire contents, simply go to the DOS prompt and enter

RSTHIST

CMDEDIT uses this command to reset the history buffer.

DIRECTORY STACK COMMANDS

CMDEDIT provides a set of commands—`PUSHD`, `POPD`, and `CHD`—that let you move quickly between different disk drives and directories. Before discussing these commands individually, it's a good idea to take note of several characteristics shared by all three.

First, unlike the DOS `CD` command, you can specify a drive as well as a directory path.

Second, the directory path specification may have a trailing `\` character. This is useful, because as indicated in Figure 2 (see the Ctrl-I entry), the CMDEDIT Expand-Filename function puts a trailing `\` after a directory name.

Third, when you execute these commands, CMDEDIT changes the drive and directory. Note that if you execute the CMDEDIT directory commands from inside an application (DEBUG for example), CMDEDIT has no way of letting the application know that the directory has been changed. Since this can confuse the application, I recommend that you use the CMDEDIT-specific directory commands only from the DOS prompt.

The CMDEDIT directory stack is basically a structure that remembers a list of drive-directory pairs and allows you to move quickly to previously visited directories. CMDEDIT stores directories in a push-down stack. Only the top of the stack is accessible. You can push a new drive-directory onto the stack, pop the top drive-directory OFF the stack, or exchange the top item with the current drive-directory. CMDEDIT's `PUSHD` and `POPD` commands allow you to store and remove the drive-directory pairs on this stack and to make the pair at the top of the stack (that is, the pair last stored) current.

The full syntax for `PUSHD` is

`PUSHD [d:][directory]`

If both optional parameters are supplied, `PUSHD` saves the current drive and directory by pushing them onto the stack. Then it changes the current drive and directory to whatever you specified. So, for example, `PUSHD C:\DOS` saves the current drive and directory and then changes to `C:\DOS`. If you omit either the disk or the directory name, the current DOS default will be assumed. Any number of `PUSHD` commands can be issued successively, as long as there is space in the memory allocated for the directory stack.

If you call `PUSHD` with no parameters, `PUSHD` replaces the drive and directory on top of the stack with the current drive and directory. Then it switches to the drive and directory that was on top of the stack. Being able to exchange drives and directories allows you to toggle back and forth quickly between two directories. If there is no previous entry on the stack, entering `PUSHD` without parameters will display an error.

The `POPD` command simply pops (takes off) the drive-directory pair at the top of the stack and makes it the current drive and directory. Note that the pair is completely removed from the stack.

An example may clarify the use of these two commands. Assume that `C:\` is the current drive and directory. You enter the following sequence of commands at the DOS prompt:

```
pushd d:\
123
pushd
WP
pushd
123
popd
```


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Let's step through this sequence: The first **PUSHD** pushes **C:** onto the stack and makes **D:** the current drive and directory. *Lotus 1-2-3* is run from this directory. The **PUSHD** without any parameters then pushes the **D:** pair onto the stack and, at the same time, removes **C:** from the stack, making it current.

After running *WordPerfect* (WP), the **PUSHD** switches again, making **D:** current and pushing **C:** onto the stack in preparation for running *1-2-3*. After running *1-2-3*, **POPD** removes **C:** from the stack and changes to it *without* pushing **D:** onto the stack.

The **CHD** command does not manipulate the directory stack. It is simply a more versatile substitute for the DOS **CD** command. Unlike **CD**, **CHD** allows you to specify the drive at the same time that you change the directory. The command syntax is

```
CHD [d:][path]
```

where *d* is the drive and *path* is the directory path specification.

Disk and path parameters are optional; if they're not supplied, the DOS default is assumed. In addition to accepting a drive and directory specification simultaneously, using **CHD** instead of the DOS **CD** command has the advantage that it does not mind the trailing **** generated by the Expand-Filename function. You may even want to define a **CMDEDIT** symbol **CD** that expands to **CHD**.

The **RSTDIR** command clears and resets the directory stack without making any change in the current drive-directory. Like the comparable **RSTHIST** command previously discussed, it takes no parameters; indeed, any supplied will be ignored.

CMDEDIT MACROS

CMDEDIT also allows you to define a sequence of one or more command lines as a macro. If the first word of the command line matches the name of a macro, then **CMDEDIT** will process the sequence of lines associated with that macro.

Macros are defined with the **CMDEDIT** **DEFM** command:

```
DEFM macro-name
```

where *macro-name* is a string of alphanu-

meric characters that designate the macro. The macro name itself may be followed by any string of characters. These additional characters are ignored by **CMDEDIT** and may thus be used as a comment.

CMDEDIT responds to the **DEFM** command with the following prompt:

```
DEFM>
```

At this point you are in programming mode, so to speak, and can type in the first line of the macro. All **CMDEDIT** line-editing and history-recall features are available while you enter the line. As usu-

**The CMDEDIT utility's
RSTDIR command
clears and resets
the directory stack
without making any
change in the current
drive-directory
specification.**

al, the end of the line is indicated by hitting Enter. This does not immediately execute the line, as it would in DOS. Rather, when you're programming a **CMDEDIT** macro from its **DEFM>** prompt, pressing Enter simply terminates the line in the macro and redisplay the prompt for you to enter the next line. You can enter as many lines as you want, up to the limit of the macro buffer space you have reserved. After you finish the last line of the macro, you indicate the end of the macro definition simply by entering the **ENDM** command:

```
DEFM>endm
```

ENDM must be the first word on the line, and any additional input on that line will be ignored. **CMDEDIT** will now store the macro you have created and process the sequence of lines whenever you enter that macro name.

To illustrate, here is the command sequence for creating the macro I use to switch to the directory on my hard disk in

which I store all my correspondence and run my editor:

```
defm letter  
=1  
cd \letters  
cs\wp\edit  
endm
```

Now, if at any DOS prompt I enter **letter**, I will be switched over to the **\LETTERS** directory on drive **C:** and my editor will be started.

MACRO PARAMETERS

Like DOS batch files, **CMDEDIT** macros can take parameters. Parameters are indicated within macro definitions by a **%** sign followed by a single numeric digit. When the macro is invoked, the parameter is replaced by the corresponding argument from the command line. For example, the letter macro above might have been defined as

```
defm letter  
cs  
cd \letters  
cs\wp\edit %1.txt  
endm
```

In that case, I might then enter

```
letter amex
```

at any DOS prompt. The lines passed to DOS would be

```
cs  
cd \letters  
cs\wp\edit amex.txt
```

CMDEDIT macro parameters are similar in concept to those in DOS batch files. Up to nine parameters can be defined. These are designated in **CMDEDIT** macros as **%n**, where *n* is a digit from 1 to 9. The parameter **%0** refers to the macro name itself. A parameter can appear anywhere in any macro line and need not be surrounded by spaces or tabs. Note that the **%** character itself can be placed anywhere in the macro if it is not followed by a digit. Further, if you do not want a **%n** sequence in a macro to be treated as a parameter, simply indicate the **%** character as **%%**. If a parameter is missing when the macro is executed, it is simply treated as an empty string.

To illustrate the difference between **%** and **%%**, consider the following macro,

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which backs up a specified file to disk A:

```
defn bf
echo Copying %1 to disk A:
pause
copy %1 a:\dir\%1
endm
```

Now, for the sake of our example, suppose the file you want to backup is called %MYFILE. When you type

```
bf %myfile
```

the following line will be executed:

```
copy %myfile a:\dir\%myfile
```

Note how %1 has been replaced by %myfile in the first and second occurrences. Note also the use of the DOS ECHO and PAUSE commands inside the macro.

Macro definitions can't be nested in CMDEDIT. In other words, a DEFM command must not appear in a macro definition. If it does, the macro will be aborted and an error message will be displayed.

Moreover, a macro cannot call another macro unless the call is the last line of the macro. Macros anywhere else are not expanded, and the line is passed to the calling application without modification. That's to say, CMDEDIT does not check the lines in a macro to see if they are themselves macros *except* in the last line of the macro. For example, consider the following:

```
defn letter2
letter %1
letter %2
letter %3
andm
```

where letter is the macro of that name defined above. When you execute

```
letter2 amex master visa
```

the following lines are passed to DOS:

```
letter amex
letter master
c:
cd \letters
c:\wp\edit visa.txt
```

Note how the parameters have been

ERROR HANDLING IN CMDEDIT

by Ashok P. Nadkarni

INSTALLATION ERRORS

If CMDEDIT encounters any errors during installation, it will abort, with one of the following messages:

- **Insufficient memory.** Reduce buffer sizes. The entire CMDEDIT program, including code and the data buffers, must fit into 65,535 bytes of memory. Since the code itself takes up about 7.5K, you have roughly 58,000 bytes for the total of your data buffers.

- **Unknown or illegal options.** This error indicates that an unknown command-line option was specified.

- **Error processing command file.** This error is a catch-all for errors encountered during processing of the initialization command file specified with the /f option during installation. This error may be generated either because the specified file could not be found or because the file contained commands other than CMDEDIT commands, macro definitions, and blank lines.

- **Error processing directory stack commands.** This message indicates that a CMDEDIT directory command (PUSHD, POPD, CHD) resulted in an error. This may be because the specified directory does not exist or because the directory stack is full (when you try to push onto it) or empty (when you try to pop a directory).

ERRORS DURING NORMAL OPERATION

If CMDEDIT encounters errors during normal operation, it aborts any ongoing macros. This is because CMDEDIT does not know whether the subsequent actions in the macro should be carried out if a previous command fails, and it's better to be on the safe side. After aborting the macro, CMDEDIT takes its next input from the keyboard so that you can decide how you want to deal with the errors. Every error message will indicate that any ongoing macro has been aborted. (This will be displayed even if no macro was currently in effect.) CMDEDIT may display the following errors during normal operation:

- **CMDEDIT : Line too long.** Any ongoing macro aborted! This error mes-

sage is displayed when the command line you've entered is longer than the maximum length allowed by the application. CMDEDIT allows lines to be up to 254 characters long. However, most applications have lower limits on line length. For example, DOS limits permissible line lengths to a maximum of 127 characters. If you are entering input from the keyboard, CMDEDIT will not allow you to enter a line that is longer than the maximum allowed by the application. However, since macros are created ahead of time, it is possible that a macro contains a line that is too long. In this case CMDEDIT will abort the macro and display this error message.

- **CMDEDIT : Directory stack empty.** Any ongoing macro aborted! This error message indicates that you tried an operation that attempted to restore a directory from an empty directory stack.

- **CMDEDIT : Invalid dir or stack full.** Any ongoing macro aborted! This error message indicates that you either tried to change to an invalid directory or tried to push a directory onto a full directory stack.

- **CMDEDIT : Nested macro definition.** Any ongoing macro aborted! CMDEDIT does not allow nested macro definitions. This error is displayed if you include a DEFM command inside a macro definition. Note that this error is displayed when you actually run the macro, not when you define it.

- **CMDEDIT : DELM used inside macro.** Any ongoing macro aborted! CMDEDIT does not allow the use of the DELM command inside a macro unless it is the last line in the macro. If you use this command inside a macro, the macro will be aborted with this message. The DELM command will not be executed.

There is one situation in which CMDEDIT will abort a macro without displaying an error message to explain why it did so. If a macro includes a CMDEDIT directory command (CHD, PUSHD, POPD) that specifies a floppy disk and the floppy drive is not loaded, DOS will display its usual "Abort, Retry, Fail?" message. If you tell DOS to ABORT, CMDEDIT will stop execution of the macro. ■

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substituted. Also notice that the first two lines in the macro definition have *not* been expanded as macros, despite that `letter` has previously been defined as a macro. Only the third—the last—line has been replaced by its macro definition.

The macro name is optional with the `DEFM` command. If it's omitted, hitting Return on a blank line will cause that macro to be run. For example, I have the following macro defined on my system:

```
defm  
dir  
endm
```

so that the directory is displayed whenever I hit Enter on a blank line.

Many of the DOS batch commands like `ECHO`, `PAUSE`, `IF`, and `FOR` (but not `GOTO` or `SHIFT`) can be used inside `CMDEDIT` macros in the same way they can go into DOS batch files. (Refer to your DOS manual for the syntax and an explanation of these commands, if they are unfamiliar.) The `bf` macro shown earlier demonstrated the use of `ECHO` and `PAUSE`. In the case of `FOR` and `IF`, the command executed must be a DOS command or program, since `CMDEDIT` passes the entire statement to DOS for execution. This way you cannot use `CMDEDIT`-specific commands, macros, or symbols as commands in `FOR` or `IF` statements. You can, however, use string variables in macros, as explained below in the section on Variables.

You can prevent expansion of a macro by putting a semicolon at the beginning of the line. (This must not be preceded even by white space. If it is, DOS will attempt to run a program whose first character is ;. If it doesn't find such a program—`;FOO`, for example—it will return a "Bad command or filename" message.) In processing the line, `CMDEDIT` will remove the semicolon, move the rest of the line up by one character, and then process the line or pass it back to the application without expanding any symbols or macros. To use a character other than the semicolon for this purpose, use the `/p` option described in `CMDEDIT` syntax.

Like symbols, macros can be automatically loaded through an initialization file, as described in the sidebar "Preparing an Initialization File."

As indicated above, `CMDEDIT` will replace parameters (`%1`, `%2` and so on) inside a macro with the corresponding argument from the command line. Arguments on the command line are normally separated by spaces or tabs. If you want an argument to contain embedded `SPACES` or `TABs`, enclose them in a pair of quotes. Including an unmatched quote will cause the remaining characters in the line to be treated as a single argument. A quote character itself can be included as part of an argument by preceding it with a `%` character. A

Many DOS batch
commands can be
used in `CMDEDIT`
macros in the same
way they can go into
DOS batch files.

`%` preceding any other character does not have any special meaning.

ABORTING MACRO EXECUTION

Macro execution can be aborted by pressing Ctrl-Break. This key combination is then passed on to the application or DOS, whichever is currently in charge of handling the Ctrl-Break code. What happens next depends on the application and DOS. Usually, DOS will terminate the application unless the application is itself handling the Ctrl-Break key.

If you wish to abort a command without aborting the entire macro as well, you can *usually* do so by entering Ctrl-C instead of Ctrl-Break. This will result in the command being aborted and `CMDEDIT` will then execute the next command in the macro. In some cases, however, an application may take over the Ctrl-Break key in such a way that `CMDEDIT` never sees it. In that case the macro will not be aborted until you enter Ctrl-Break after exiting the application.

A useful technique I have found is to set up a recursive macro to carry out a sequence of instructions repeatedly. You can stop execution of the macro through the use of the Ctrl-Break key. For example, during the development of this program, I

made use of the following helpful macro:

```
defm testcmd  
edit cmdedit.asm  
masm cmdedit.asm;  
link cmdedit.asm;  
cv /cn16 cmdedit.com  
testcmd  
endm
```

The macro first brings up the editor to edit the program file. It then automatically assembles (`MASM`) and links (`LINK`) the program and runs the debugger. Finally it calls itself (the call to itself is the *last* line in the macro so that it will be recognized as a macro call), and the cycle is repeated. This goes on until Ctrl-Break is entered to stop the macro execution.

`CMDEDIT` macros can be deleted with the `DELM` command. As with the previously discussed `DELS` command, `DELM` is useful for recovering macro buffer space when a macro is no longer needed or to delete the current macro definition to get back the previous definition of the same name. The command has this syntax:

```
DELM macro1 macro2 .... macroN
```

where `macro1`, `macro2`, . . . `macroN` are the names of the macros you wish to delete. If a particular name does not exist, `CMDEDIT` will ignore it and go on to the next. Note, however, that the `DELM` command deletes only the *latest* definition of the corresponding macro. If the same macro name is used several times in the `DELM` command, then that number of macro definitions having that name will be deleted.

Note also that `DELM` cannot be used inside a macro definition *except* as the *last* line of the definition. (If you use it in the middle of a macro, the macro execution will be aborted and you'll get an error message.) Here is an example of a temporary macro that runs once and then deletes itself. You might use such a macro when you have a sequence of commands that take some time to run.

```
defm tempmacro  
cc -o -s file1.c  
cc -o -s file2.c  
link file1+file2;  
delm tempmacro  
endm
```

You can now enter `tempmacro` to execute the command sequence while you go get a cup of coffee. The macro will be deleted

CMDEDIT BY MODEM

The programs published in *PC Magazine* are available by modem from PC MagNet.

To join PC MagNet, set your communications software for either 300 or 1,200 bits per second, 7 data bits, even parity, 1 stop bit, and full duplex. To find the number nearest your dialing exchange, dial (800) 346-3247. In Canada call (800) 635-6225 (voice only). When the modem connects, press Enter. At the HOST NAME prompt, enter PHONES. Follow the menus and note the number closest to you. If you have a CompuServe account type G PCMAG at any ! prompt.

After you have found the phone number nearest you hang up and dial using that number. When you connect with PC MagNet, press Ctrl-C. At the HOST NAME prompt, enter CIS. At the USER ID prompt, enter 177000,5000. Enter PC*MAGNET at the PASSWORD prompt and Z10D9000 at the ENTER AGREEMENT NUMBER prompt. For Customer Service, call (800) 848-8990; outside the United States, call (614) 457-8650.

To download CMDEDIT.COM and/or its assembly language source listing and BASIC listing, log on to PC MagNet. Enter GO UTILITIES or choose PC MAGAZINE UTILITIES from the top menu, then DIRECT UTILITY DOWNLOAD from the next menu. Enter the filename, then select the file you want to download from those presented. Answer yes (Y) to DO YOU WISH TO DOWNLOAD? Press Enter to see the transfer protocols. Choose a protocol and download the file.

You don't have to be a member of CompuServe to access PC MagNet. It costs \$12.80 an hour for 1,200/2,400-bps service and \$6.30 for 300-bps, via MasterCard, VISA, or American Express. These programs can be copied but are copyrighted and are made available only for noncommercial use. You may

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Ashok P. Nadkarni

CMDEDIT Command

September 25, 1990 (Utilities)

Purpose:

A TSR that supplies full editing features to the DOS interface, stacks commands and drive-directory pairs for recall, supports definable symbols and variables and programmable function-key definitions and macros, provides optional autocompletion of commands and filenames, and enables changing drives and directories simultaneously.

Format:

CMDEDIT [/r] [/i] [/g] [/pX] [/dN1] [/mN2] [/bN3] [/sN4] [/ffilename] [/u]

Remarks:

CMDEDIT can be entered at the DOS prompt but is normally installed through the AUTOEXEC.BAT file. Its optional parameters at installation are

table border="0">
/r	Toggles auto-recall mode (default: off)
/i	Toggles insert mode (default: overwrite)
/g	Toggles silent mode (default: beeps on error)
/p	Sets the ignore macro character (default X is ;)
/d	DOS command stack buffer (default N1 is 512 bytes)
/m	Macro buffer size (default N2 is 512 bytes)
/b	Symbol buffer size (default N3 is 512 bytes)
/s	Directory stack size (default N4 is 256 bytes)
/f	Initialization file to read at start-up (default: none)
/u	Uninstalls CMDEDIT

The CMDEDIT Ctrl-key editing actions are

Ctrl-F or Right Arrow	Cursor forward (character)
Ctrl-B or Left Arrow	Cursor backward (character)
Ctrl-Right Arrow	Cursor forward (word)
Ctrl-Left Arrow	Cursor backward (word)
Ctrl-E or End	Cursor to end of line
Ctrl-A or Home	Cursor to start of line
Ctrl-D or Del	Delete character at the cursor
Ctrl-H or Backspace	Delete previous character
Ctrl-W	Delete word at right of cursor
Ctrl-L	Delete word at left of cursor
Ctrl-[or ESC	Erase entire command line
Ctrl-K	Delete from cursor to end of line
Ctrl-X	Delete from cursor to start of line
Ctrl-O	Delete from cursor to EOL and execute line
Ctrl-G	Erase entire line but keep in stack
Ctrl-6	Execute line, but do not store or display (for passwords)

CONTINUE

Ins	Toggle insert/overtyping modes
Ctrl-I or Tab	Expand partial filename or directory name (adds \) if possible
Ctrl-J	Replace variables with values
Ctrl-Q	Place succeeding Ctrl-key on line as literal instead of command
Ctrl-Z	Put end-of-file marker on line

Commands given at the DOS prompt can be recalled from their buffer using the Up Arrow (Ctrl-U) or Down Arrow (Ctrl-N) keys. Commands beginning with one or more user-typed letters can be recalled with Ctrl-R or Ctrl-V. In auto-recall mode, activated either with the /r switch or toggled by Ctrl-Y, a command-stack search is made as each letter is typed in.

The PUSH *d:\path* command changes to and stacks a drive-directory pair. If at least one pair has been pushed into this buffer, entering PUSH without parameters toggles between the current and stored pairs. POP changes to and removes a stacked drive-directory pair, and the CHD *d:\path* command allows changing to a drive and directory simultaneously without affecting the stack.

The DEFS *symbol string* command allows abbreviating a long command (the *string*) with one or more characters (the *symbol*). By using F1...F0 (for F10) and SF1...SF0 as the *symbol* values, the function and shifted function keys can be programmed to output *strings* on the command line. If these strings end in the @ character, they will be executed, as well. To be expanded into its defined string, a symbol must be the first word on the command line. Before being passed to DOS or to an application, the command line is scanned recursively, so one symbol can define another.

Multiline command macros are created by issuing the DEF *macroname* command. Each line is terminated by hitting Enter, and the macro is terminated with the ENDM command. Macro command lines may contain parameters, which are designated by %*n* (*n* is a numeral from 1 to 9). Parameters are processed much as in DOS batch files (see article text). Macros support DOS batch file commands such as ECHO, PAUSE, IF, and FOR; see text for restrictions. Embedded spaces and tabs in macro command-line arguments must be enclosed in pairs of quotes. Macros cannot be nested, and one macro can call another only from the last line before ENDM.

Macros and symbols also support the use of string variables, which must be enclosed within percent signs. See the article text for how these are processed. Macros and symbols may be deleted by name with the DELM and DELS commands, respectively, and the respective CMDEDIT buffers can be cleared and reset with the RSTHIST, RSTSYM, RSTDIR, and RSTMAT commands.

Instructions for preparing an initialization file to load regularly used macros and symbols via the /f parameter option are presented in a sidebar to the main article.

ENDS

Utilities

CMDEDIT BY MODEM

make copies for others as long as no charge is involved, but making copies for any commercial purpose is prohibited.

Like all good software, the programs presented in *PC Magazine* are upgraded and improved. The only way to obtain the modified versions is to download them from PC MagNet. Here is a partial list of the programs that have been upgraded to fix minor bugs and system incompatibilities:

ANSI.COM, Version 1.3
 BEN55.ARC (PC Labs Benchmark Series, Version 5.5)
 CARDFILE.COM, Version 1.1
 CHKFRAG.EXE, Version 1.2
 DIRMATCH.COM, Version 1.1
 EMS40.SYS, Version 1.1
 LITES.COM, Version 1.1
 LOG.COM, Version 1.1
 PCMANAGE.EXE, Version 1.1
 RN.COM, Version 2.0
 SLICE.COM, Version 1.3
 SNIPPER.COM, Version 1.2
 TPFST-AT.COM, Version 1.1
 ZCOPY.COM, Version 1.2

For a complete list of all the programs available from the PC MagNet Utilities Database, download UDCAT.ARC.

A downloadable index to *PC Magazine's* product reviews is also available. PCM.EXE is a self-extracting file that contains the *Computer Library PC Magazine Reviews Index* for January 1988 to December 1989. It requires the search files in PCSRCH.EXE. Please read the information file PCM.INF before you download any of these files.

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Utilities

after execution so that it does not continue to take up room in the macro buffer.

The RSTMAC command clears and resets the macro buffer, and any characters following the command are ignored. If RSTMAC is used inside a macro, the macro will exit at that point (no error is generated) and the macro buffer will be reset.

Note that the following macro resets CMDEDIT *completely*:

```
defm resetcmddedit
rsthist
ratsym
rstmdir
ratmac
endm
```

VARIABLES

CMDEDIT lets you find the values of string variables, which are sequences of characters enclosed between two % characters. Before executing a command or passing it to the application, CMDEDIT replaces all such variables in the command line by their corresponding string values. If the variable is not defined, it is replaced with a NULL string. For example, in the line

```
tcc %OPTIONS% file.c
```

the variable OPTIONS (and the surrounding % characters) will be replaced by its value.

The variables CMDEDIT can handle are of two types: DOS environment variables and CMDEDIT symbols.

CMDEDIT supports DOS environment variables in the same way that they are used in DOS batch files. You define a DOS environment variable with the SET command in DOS (refer to your DOS manual for details). If you load secondary copies of COMMAND.COM, however, DOS may have multiple environments. So CMDEDIT uses the DOS environment itself, rather than a static copy of it.

CMDEDIT can also use symbols defined with its own DEFS command as variables. (See the section on Symbol Definitions above.) Note that you should not normally use the % characters as part of the symbol name. Use percent signs to enclose a symbol only when you wish to have it treated as a variable.

CMDEDIT and DOS look for variables in a similar way. Characters between sin-

gle % characters are treated as variables. A pair of % characters next to each other is treated as a single % character, not the start of a variable. For example, the line

```
%%VAR%
```

will result in a single character % followed by the expansion (the symbol definition) of the variable VAR. (Note: As in DOS batch files, you should not put %1 parameters and %VAR% variables together in a CMDEDIT macro.)

Although CMDEDIT processing is similar to that of DOS, it is not identical. When CMDEDIT does symbol substitution on a line, it leaves all pairs of adjacent % characters intact, while expanding vari-

CMDEDIT has the ability to determine the values of string variables.

ables. When it finds a variable in the line, it first looks for it in the DOS environment and replaces it if found. Otherwise, it tries to replace it with a matching CMDEDIT symbol value. If no such symbol exists, it is replaced with a null string.

This procedure continues until there are no variables left in the line. Now, any % pairs are replaced by a single % each. Note that in this process *any single % will be deleted*. (As indicated in the concluding section on Caveats, the reason for doing this is to emulate the behavior of DOS batch files.) No further variable expansion is done after this, even though the new line created after replacing the %% with % might have variables embedded in it.

You can use a variable as any part of a symbol definition. The variable will be expanded when the symbol is defined, not when it is expanded (either as a symbol command or a function-key definition). For example, suppose you set up the following symbol definitions to run your compiler:

```
defn options -G -N -Y
defn cc \turbo\tcc %OPTIONS%
```

At this point, the symbol cc will effective-

ly be set up in the following manner:

```
\turbo\tcc -G -N -Y
```

In this case, even if you redefine the options symbol later, the symbol cc is not affected. If you had instead defined

```
defn options -G -N -Y
defn cc \turbo\tcc %%OPTIONS%%
```

(note the doubled % characters), then the symbol cc would be set up as

```
\turbo\tcc %%OPTIONS%
```

In this second case, when you executed the cc command, the current value of the variable OPTIONS would be used instead of the value in effect when cc was defined. This facility can be very useful in changing program parameters without changing the symbol that calls the program.

Note that, as with DOS, you can use a variable in its own redefinition. For example, the following command

```
defn options %options% -r
```

will append -r to the current value of OPTIONS. However, if you try the following

```
defn options %%options%% -r
```

(again note the additional % characters), you will find your command in a recursive loop when you try to execute a command containing the OPTIONS variable. The line will keep growing longer until CMDEDIT displays its "Line too long" error message.

Different considerations apply to the use of variables in macros. Variables used inside a macro definition are always expanded at the time the macro is called, not at the time it is defined.

You can expand all the variables on the command line using the Ctrl-J key. This is useful both for viewing what the current definition of a variable is and for editing a variable. For example, if you enter

```
PATH=%PATH%
```

when you hit the Ctrl-J key, the current expansion for the DOS environment variable PATH will be placed on the command line. You can then edit it with the usual CMDEDIT editing keys and execute the line to create an altered definition of the PATH environment variable.

Utilities

ADDITIONAL FEATURES AND COMMANDS

With CMDEDIT loaded, you can display your currently defined macros and symbols from the DOS prompt simply by entering

CMDSTAT

Any additional characters typed on the line will be ignored. On the display, the symbols will be preceded with a DEFS; the macros will be preceded with a DEFM, followed by the macro name, and end with an ENDM.

Unless you have an unusually small number of symbols and macros defined, the output of the CMDSTAT command will not fit on a single screen. To solve this problem, you can define the CMDLIST macro shown below. (The macro assumes that the DOS COMMAND and MORE programs are in a directory specified in your PATH statement. If this is not the case, you'll have to specify their location.) Note that, as shown below, the CMDSTAT command can be used inside a macro or as part of a symbol definition.

```
defm cmdlist
debug | more
cmdstat
q
endm
```

The macro works very simply. It starts up COMMAND.COM with its output directed to the program MORE, instead of to the screen. When CMDEDIT outputs its macro and symbol definitions, the output is also directed into the MORE program, which displays it one screen at a time. The Exit at the end terminates the COMMAND.COM program and exits to DOS.

The macro above must be run at the DOS command line. As an alternative to defining the macro, you can instead type in the commands directly at the DOS command line.

SYMBOLS VS. MACROS

Symbols are normally used to abbreviate long single-line commands, whereas macros are used for more-complex command sequences. When a symbol is executed, any remainder on the line is simply appended to the symbol definition. In the case of a macro, the rest of the line is *not*

appended to the macro expansion, but instead provides the actual parameters to replace the dummy parameters (%1, %2, and so forth) inside the macro definition. Consider the following definitions:

```
defs es c:\wp\edit
defm em
c:\wp\edit
endm
```

When you execute

```
es filename
```

the command

```
c:\wp\edit filename
```

will be executed. On the other hand,

```
em filename
```

will execute

```
c:\wp\edit
```

If you wanted the macro *em* to behave like the symbol *es* you would need to include a %1 parameter in the macro definition.

You can use a macro in a symbol definition and vice versa. Just keep in mind the rules I've been explaining. For example, if you use a symbol inside a macro definition and the symbol itself expands to a macro, this second macro will not be recognized as a macro unless the symbol was on the last line of the macro that included it. Further, you can use the DEFS command inside a macro.

Normally, you should not give the same name to symbols and macros. CMDEDIT first checks the line for a symbol and then for a macro name. Hence, you shouldn't use a macro name that has the same name as a symbol.

MACROS VS. DOS BATCH FILES

You will have noticed that CMDEDIT macros are similar in many ways to DOS batch files. It might be useful, then, to list some of the differences between the two and the advantages and disadvantages of each.

DOS batch files (especially if you include consideration of *PC Magazine's* BATCHMAN utility, presented in the January 30, 1990, issue) are in general more powerful. In particular, they can use two commands, GOTO and SHIFT, that cannot be used (they are ignored) in CMD-

EDIT macros. Again, in DOS 3.3 and later, batch files can call other batch files as subroutines using the CALL command; in earlier versions you can do this using COMMAND \C. CMDEDIT macros behave somewhat differently than either of these. CMDEDIT will *not* check the lines inside macros to see if they contain macros *except* in the last line of the macro. Thus CMDEDIT allows only the last line of a macro to be treated as another macro.

On the other hand, CMDEDIT macros have two advantages over DOS batch files. The first is their speed of execution. Since they are stored in memory, they execute much more quickly than DOS batch files. Second, CMDEDIT macros occupy much less disk space than the equivalent DOS batch files. Each DOS file takes up at least one cluster of disk space (which is usually between 512 bytes and 2K) no matter how small it is. CMDEDIT macros on the other hand are all stored in a single initialization file, so they occupy much less space. This is particularly important on floppy disk systems.

Overall, then, I recommend that you use batch files for long or complex sequences of commands and use CMDEDIT macros otherwise. In this connection, note that you can call DOS batch files from inside CMDEDIT macros but not the other way around.

CAVEATS

CMDEDIT has no known major interaction problems with other software. However, there are a couple of things you should know about before using the utility.

■ As indicated previously, in order to emulate DOS batch file behavior, any single % characters are deleted. If you want a percent sign to be part of the command line that you pass back to the application, then you must enter it as *two* adjacent % characters.

■ When you expand variables on the command line, the cursor may change position, depending on where it was before you pressed Ctrl-J. This is because it is not always possible for CMDEDIT to tell where you would like it to be when a set of characters (the variable) is replaced by another (the expansion).

In short, CMDEDIT's many facilities offer something to every PC user—whether you're just a beginner or a long-time power user. ■

Ashok P. Nadkarni is a first-time contributor to PC Magazine.

by
Charles Petzold

Environments

In the last issue, I discussed the bitmap formats that have emerged in *Microsoft Windows* and the OS/2 Presentation Manager. A bitmap—little more than an array of bits that correspond to the individual pixels of a graphical image—is one of two common methods of storing graphical data. The other is the *metafile*.

Like bitmaps, metafiles may exist in memory or as disk files. But that's where the similarity ends. A metafile contains not a pixel image, but encoded drawing commands that create an image out of lines, filled areas, and text strings.

BITMAPS AND METAFILES COMPARED

Suppose you have both a bitmap and a metafile that contain an image of a diagonal line. The bitmap must have a particular pixel dimension, let's say 64 pixels high by 64 pixels wide. If the bitmap is monochrome (in which one bit is required for each pixel) the image would require 4,096 bits, or 512 bytes. Most of the bits would be 0 (representing a background). The bits representing the line would be 1—perhaps the first bit in the top row of pixels, the second bit in the second row of pixels, and so forth.

In the metafile, the line would be represented by two codes, each followed by a coordinate position. The first code would indicate the coordinate where the line begins and the second code would indicate the coordinate where the line ends. These coordinates could be arbitrary, perhaps (0,0) and (100,100).

If such a bitmap is displayed on a monitor with a resolution of 64 dots per inch, the line would appear to be the diagonal of a 1-inch square box. On a 300-dpi laser printer, it would be much smaller. You could try making the bitmap larger by duplicating rows and columns of pixels, but the more you expanded it, the more it would resemble stair steps rather than a line. On the other hand, if you compressed the bitmap by eliminating rows and columns of pixels, the line might disappear altogether!

Metafile Support Under The OS/2 Graphics Programming Interface

■ Metafiles are one of the common methods used to store graphical data. Here's an introduction to their format and functions in OS/2.

The metafile has no such problems. A graphics system would simply draw a line based on the coordinates encoded in the metafile. These coordinates could be scaled to any dimension for any output device by some simple multiplications. No matter how you change the scale, the image always looks like a line.

A bitmap is a raster image; a metafile is a vector image. A bitmap is commonly associated with *paint* programs; a metafile is associated with *draw* or CAD programs. Bitmaps are essential for images that come from the real world, such as digitized photographs. These cannot easily be represented by lines, filled areas, and text. Metafiles make much more sense for human or program-created images, for example architectural drawings.

A big advantage of a metafile is that it can be decomposed into its components (the lines, filled areas, and text), edited, and reassembled. In the above example, the line encoded in the metafile could easily be moved 10 units to the right by simple additions. Algorithmically modifying a bitmap image in such a way would require a great deal of program intelligence.

Just as there are many bitmap formats

in common use under various graphics systems, there are many metafile formats. Both *Windows* and the OS/2 Presentation Manager support metafiles, but the two formats are very different. Whereas it is usually straightforward to convert from one bitmap format to another, converting among metafile formats can be a real problem. This is because the contents of the metafile are very closely linked to the underlying graphics system that supports the format.

Suppose you want to convert a PM metafile into a *Windows* metafile and suppose the PM metafile contains a Bezier spline curve. *Windows* doesn't support spline curves. The spline curve could be approximated by a series of short lines, but no matter how short they were, they'd still look like straight lines if you zoomed in on the image.

Indeed, this is one of the big problems if OS/2 2.0 is to run unmodified *Windows* 3.0 programs in the Presentation Manager. Metafiles can be exchanged among applications through the Clipboard, so copying a metafile image from a PM program and pasting it into a *Windows* program would require such a conversion.

THE GPI METAFIELD FUNCTIONS

For the remainder of this article, I'll stick to the metafile support under the OS/2 Graphics Programming Interface (GPI).

Under OS/2 1.1, 1.2, and the beta of Version 2.0, GPI has eight metafile functions. These are listed in Figure 1. (Just to keep you on your toes, these functions treat the word metafile as if it were two

Environments

OS/2 METAFILE FUNCTIONS	
Function	Description
GpiCopyMetaFile	Creates a copy of a metafile
GpiDeleteMetaFile	Deletes a metafile
GpiLoadMetaFile	Loads a metafile from a disk file
GpiPlayMetaFile	Renders a metafile on an output device
GpiQueryMetaFileBits	Obtains the contents of a metafile
GpiQueryMetaFileLength	Obtains the size of a metafile
GpiSaveMetaFile	Saves a metafile to a disk file
GpiSetMetaFileBits	Sets the contents of a metafile

Figure 1: These are the eight metafile functions supported under the OS/2 Graphics Programming Interface (GPI).

words, capitalizing both the M and the F. This is not correct.)

You refer to a metafile stored in memory by a handle, which is simply a number that GPI gives your program when you create a metafile, load a metafile from a disk file, or copy a metafile. The handle to a metafile has a type of HMF, so you can define a variable for this handle using

```
HMF hmf ;
```

If a metafile exists on-disk, you can load it into memory simply by calling

```
hmf = GpiLoadMetaFile (hab,  
szFilename) ;
```

where hab is the anchor block handle returned from the WinInitialize function and szFilename is the name of the metafile file. By convention, GPI metafiles have an extension of .MET. Beginning in OS/2 1.2 there is also an extended file attribute for metafiles.

If a program has a handle to a metafile, the metafile can be saved to a disk file using the following code:

```
GpiSaveMetaFile (hmf, szFilename);
```

This function will delete the metafile from memory, rendering the metafile handle invalid. The function fails if the file already exists.

GpiLoadMetaFile and GpiSaveMetaFile are the only functions that work directly with disk-based metafiles. All the other functions work with metafiles stored in memory.

A metafile can be copied very easily:

```
hmf = GpiCopyMetaFile (hmfSource);
```

and deleted:

```
GpiDeleteMetaFile (hmf) ;
```

The GpiQueryMetaFileBits function allows a program to copy the contents of a metafile into local storage in the program,

**Both Windows and the
OS/2 Presentation
Manager support
metafiles.**

perhaps for editing or analysis. (I'll be discussing the format of the metafile shortly. The format is the same for memory-based metafiles and disk-based metafiles.) The function allows you to copy less than the full metafile into local memory so that you can work with metafiles larger than 64K. The 64K problem disappears with the 32-bit flat memory space of OS/2 2.0. You can obtain the size of a metafile by calling GpiQueryMetaFileLength. The GpiSetMetaFileBits works in the opposite way from GpiQueryMetaFileBits, that is, it copies from local storage into an existing metafile.

The GpiPlayMetaFile allows rendering

a metafile on an output device such as a video display or a printer. This function has lots of options, as I'll discuss later.

We seem to be missing one essential function here—you can load a metafile from a disk file and make a copy of it, but how do you create a metafile to begin with? If you've been following this column for a while, you're already familiar with the functions required for that job.

CREATING A METAFILE

To create a metafile in memory, you first open a metafile device context by calling DevOpenDC with the OD_METAFILE parameter. You'll recall back in the February 27, 1990, issue we used this same function for opening a device context for a printer, and in the May 29, 1990, issue to open a "memory" device context for drawing on a bitmap. A *device context* is usually defined as a graphics output device and its device driver, but the metafile device context and the memory device context do not refer to real devices.

You use the function GpiCreatePS to create a presentation space associated with the metafile device context. This function returns a handle to a presentation space, which you then use with GPI drawing functions. The functions that you call using this presentation space handle are stored in the metafile.

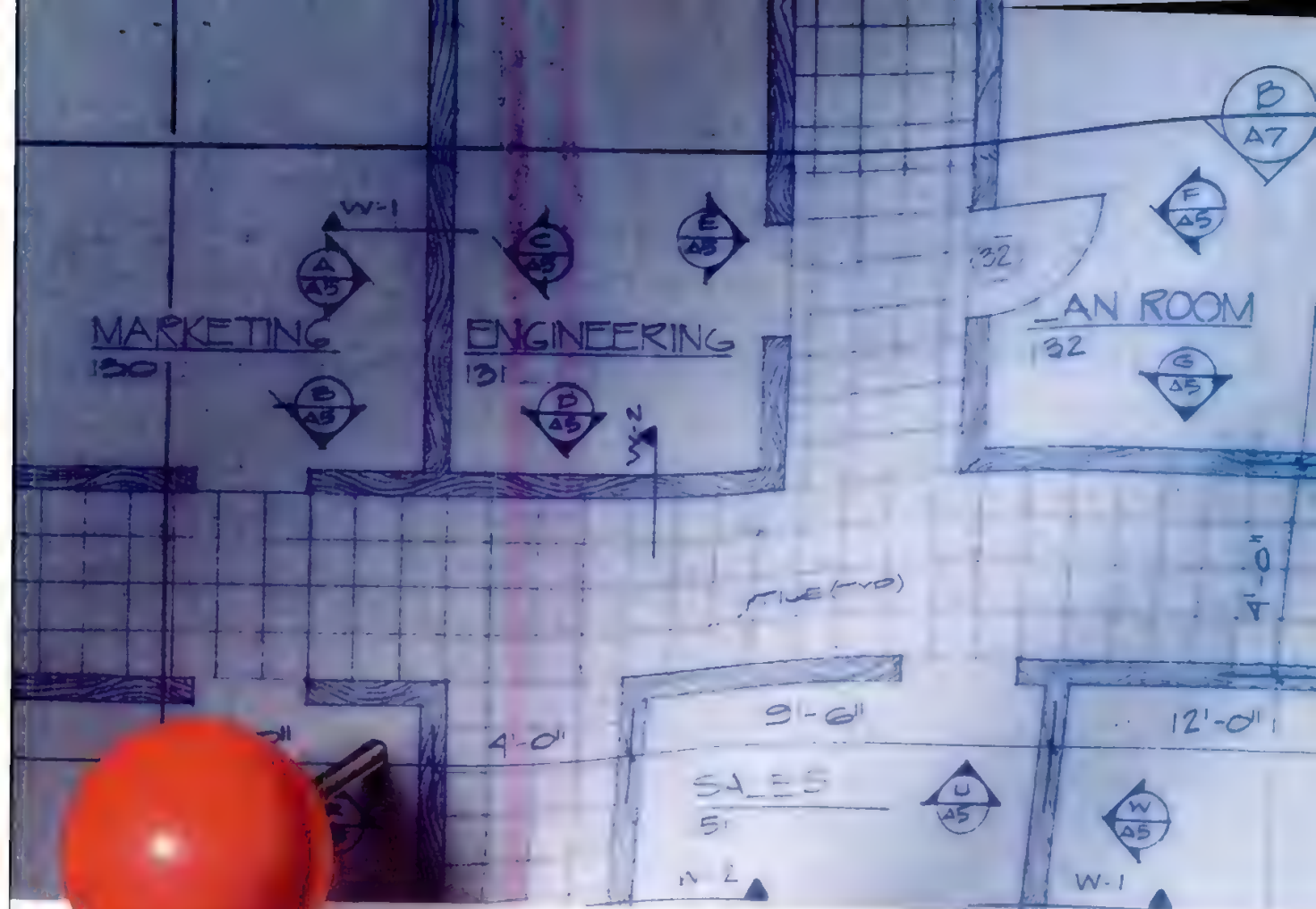
You then destroy the presentation space by calling GpiDestroyPS and close the device context by calling DevCloseDC. The DevCloseDC function returns a handle to the metafile.

A SAMPLE PROGRAM

Just to show you how simple this can be, let's take a look at a sample program that creates a metafile containing a little drawing of a house constructed from eight lines. The program "plays" the metafile on the program's window and saves it to a disk file.

The METAFILE program is shown in Figures 2 through 4. I'm assuming here you'll be using Microsoft C 6.0 installed for OS/2 1.2 development.

While processing the WM_CREATE message in ClientWndProc, the program calls the function CreateMetaFile located at the bottom of METAFILE.C. The DevOpenDC function opens the metafile device context. Note that the second field of the DEVOPENSTRUC structure passed to this function must contain a device driver name. The metafile is said to be "compatible" with this device. This com-



NetPort™ makes sticking another printer on the network almost this easy.



the inconvenience of other printer methods. In fact, NetPort lets you connect printers or plotters directly to the network at any thin-wire Ethernet™ T-connector.

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intel

Environments

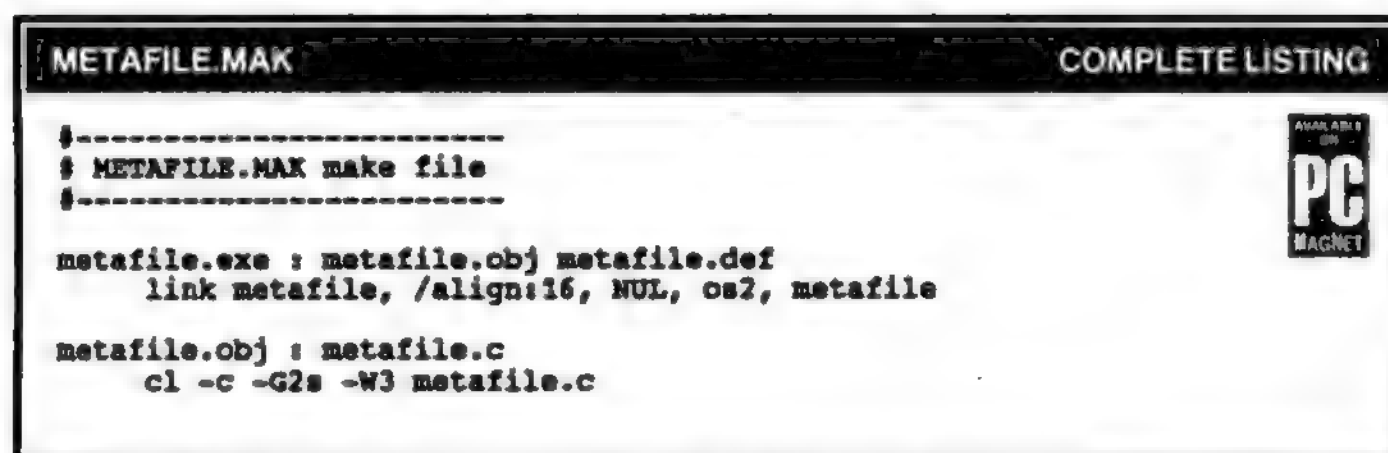


Figure 2: This file automates creation of METAFILE.EXE using Microsoft C 6.0.

patibility mostly affects a color table stored in the metafile. I've simply used DISPLAY for this field, which is the device driver for the video display.

Optionally, the fifth field of the DEVOPENSTRUC structure (the field named pszComment) can be set to an ASCII text string that describes the metafile. If you do this, the fourth parameter to DevOpenDC would be set to 5L, rather than 2L, to indicate five fields of the structure.

The next step is creating a presentation space associated with this device context. I've set the page units to PU_LOENG-

LISH, which means that coordinates are in units of 1/100 inch. The SIZEL structure passed to the GpiCreatePS function indicates the total size of the image, which is 100 units (or 1 inch) wide and 150 units high. You could also set the fields of this structure to 0 to use a default page size.

Calls to GpiMove and GpiPolyLine create the image in the metafile. The program then destroys the presentation space and closes the device context to obtain the handle to the metafile. ClientWndProc stores this in a static variable.

The remainder of the program is fairly

simple: to display the metafile image on the program's window, during the WM_PAINT message, ClientWndProc obtains a presentation space handle by calling WinBeginPaint, erases the window, and then draws the metafile by passing both the presentation space handle and the metafile handle to GpiPlayMetaFile. By default, the image appears in the lower-left corner of the window.

You may note that the image is displayed 100 pixels wide and 150 pixels high, not 1 inch high and 1.5 inches wide (except if you have a 100-dpi monitor, of course). Towards the end of the column, I'll discuss this problem and tell you how to solve it.

During the WM_DESTROY message, ClientWndProc calls GpiSaveMetaFile to save the metafile to a file called HOUSE.MET. In case the file already exists (which would cause the GpiSaveMetaFile function to fail), the call is preceded by a call to DosDelete to delete a previous HOUSE.MET file.

After running METAFILE and creating the HOUSE.MET file, you may want to go ahead and try a little variation of the program: change the WM_CREATE pro-

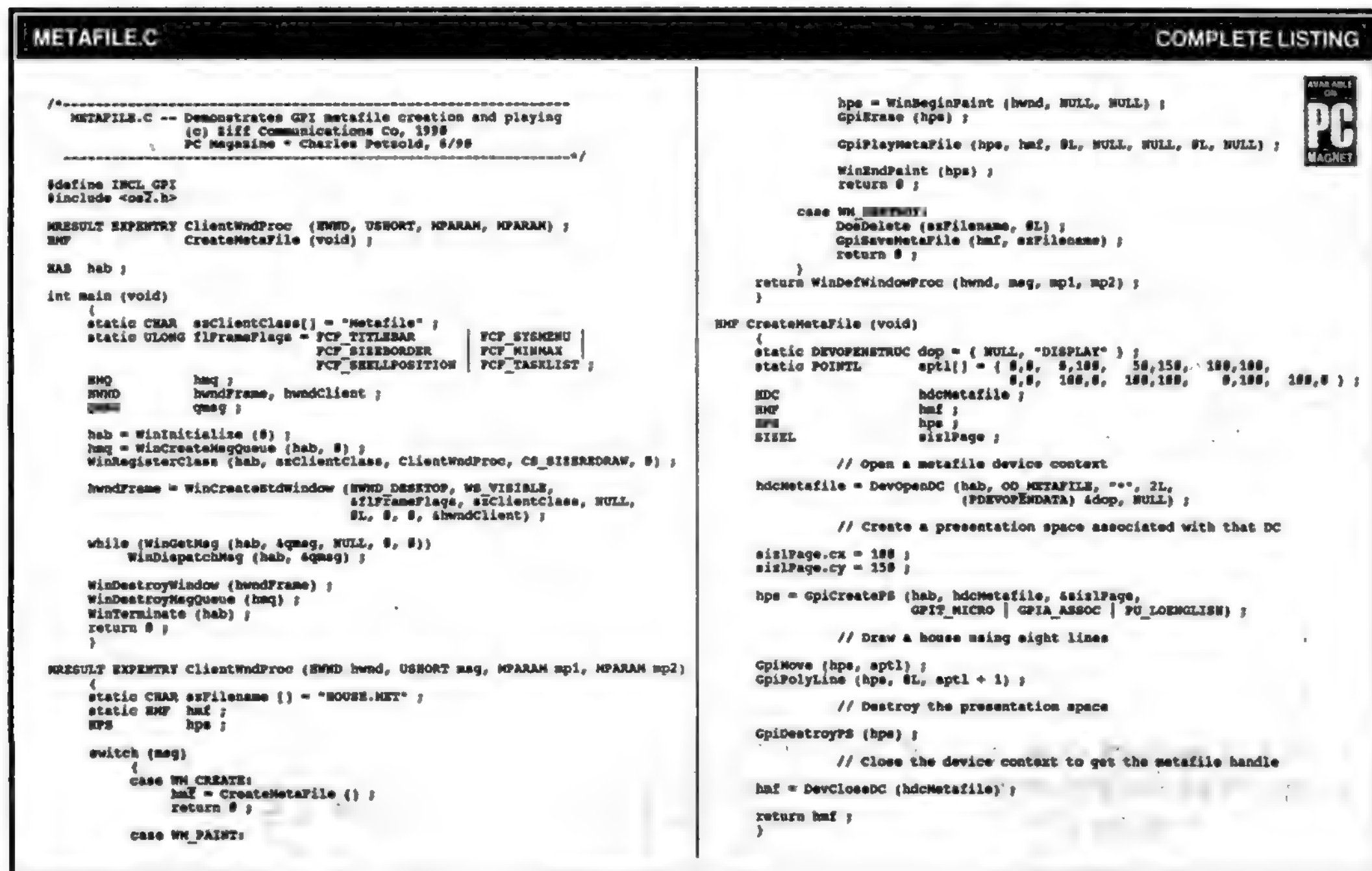


Figure 3: Here is the C source code for METAFILE.

Environments

METAFILE.DEF		COMPLETE LISTING
;----- ; METAFILE.DEF module definition file ;-----		
NAME	METAFILE WINDOWAPI	
DESCRIPTION	'GPI MetaFile Demonstration (c) Ziff Communications Co, 1990'	
PROTMODE		
HEAPSIZE	1024	
STACKSIZE	8192	



Figure 4: This is METAFILE.C's module definition file.

cessing so that the program calls

```
hmf = GpiLoadMetaFile (hbf,
    szFilename);
```

rather than CreateMetaFile. The program will then load the metafile from the disk rather than creating it from scratch.

Using the Display Picture program included with OS/2 1.2 (installed by default in the Utilities group), you can also view the metafile. Unlike METAFILE, you'll find that this program scales the image to the size of the window. Towards the end of this column, I'll discuss how this program does that.

Of course, many PM drawing programs, word processing programs, and desktop publishing programs will allow importing metafiles from the disk or the clipboard because it is so easy.

THE METAFILE FORMAT (IN BRIEF)

Under OS/2 1.2, the HOUSE.MET file is 711 bytes in length. Figure 5 shows a hexadecimal dump of the file.

If METAFILE were to call GpiQueryMetaFileBits after creating the metafile, it would obtain exactly the same data. I won't go into the format in detail, because it is quite complex and is documented in the IBM Programming Reference for OS/2. (Unfortunately, the Microsoft OS/2 Programmer's Reference does not include this information.) What you'll get here is a rudimentary road map.

The metafile is divided into records, some of which are fixed in length and some of which are variable. Each record begins with a 2-byte record length (high byte first). For example, the file begins with the hexadecimal bytes 00 20, indicating a record that is 32 (decimal) bytes long. The second record begins at offset 0x0020 in the file. In each record, the next 3 bytes indicate the record type. The first record is

type 0xD3A8A8, which means Begin Document. The last record is type 0xD3A9A8, which means End Document.

The largest record in HOUSE.MET begins at offset 0x0040 in the file and is of type 0xD3B077. This is the Color Attribute Table record that matches the 16 color indices (CLR_BLACK and so forth) used by PM programs to red-green-blue color

values. Each color index requires 15 bytes. (The GPI metafile format is not exactly the most concise thing ever created.)

Most of the records describe an "environment" for the actual image. The color table is part of this environment. So is information about the presentation page units (set to PU_LOENGLISH in the GpiCreatePS function) and the page size.

The actual image itself is defined in the record that begins at offset 0x0233 in the HOUSE.MET file. The record type is 0xD3EEBB, which means it's a Graphics Data record. The information in this record can be decoded using structures and identifiers in the PMORD.H header file included with the Programmer's Toolkit and Microsoft C 6.0. (ORD stands for *graphics orders*, which means drawing functions and attribute-setting functions.) The byte 0x21 in that record is the code for GpiMove, and 0x81 is the code for GpiPolyLine. These are followed by a data length and coordinates.

You probably see at this point that it's

A HEX DUMP OF THE HOUSE.MET FILE			
0000-0000	00 20 D3 A8 A8 00 00 00-30	30 30 30 30 30 30 31	00000001
0000-0010	00 00 05 18 03 0C 00 06-01	03 D4 03 52 03 65 00	R.O.
0000-0020	00 10 D3 A8 C6 00 00 00-30	30 30 30 30 30 30 32	00000002
0000-0030	00 10 D3 A8 77 00 00 00-30	30 30 30 30 30 30 34	...w.....00000004
0000-0040	00 FB D3 B0 77 00 00 00-40	00 00 0F 01 00 01 00	...w...0.....
0000-0050	00 00 08 08 08 04 00 FF-FF	FF 0F 01 00 01 00 00	.....
0000-0060	01 08 08 08 04 00 00 00-FF	0F 01 00 01 00 00 02	.....
0000-0070	08 08 08 04 00 FF 00 FF-0F	01 00 01 00 00 03 08	.....
0000-0080	08 08 04 00 FF 00 FF 0F-01	00 01 00 00 04 08 08	.....
0000-0090	08 04 00 00 FF 00 0F 01-00	01 00 00 05 08 08 08	.....
0000-00A0	04 00 00 FF FF 0F 01 00-01	00 00 06 08 08 08 04	.....
0000-00B0	00 FF FF 0F 0F 01 00 01-00	00 07 08 08 08 04 00	.....
0000-00C0	00 00 00 0F 01 00 01 00-00	08 08 08 08 04 00 80	.....
0000-00D0	00 00 0F 01 00 01 00 00-00	08 08 08 04 00 00 00	.....
0000-00E0	00 0F 01 00 01 00 00 0A-08	08 08 04 00 80 00 80	.....
0000-00F0	0F 01 00 01 00 00 0B 08-08	08 04 00 00 00 00 0F	.....
0000-0100	01 00 01 00 00 0C 08 0E-00	04 00 00 00 00 0F 01	.....
0000-0110	00 01 00 00 0D 08 08 08-04	00 00 80 00 0F 01 00	.....
0000-0120	01 00 00 0E 08 08 08 04-00	80 80 00 0F 01 00 01	.....
0000-0130	00 00 0F 08 08 08 04 00-CC	CC CC 00 10 D3 A9 77	w
0000-0140	00 00 00 30 30 30 30 30-30	30 34 00 10 D3 A8 BB	...00000004...w
0000-0150	00 00 00 30 30 30 30 30-30	30 37 00 10 D3 A8 C7	...00000007...w
0000-0160	00 00 00 30 30 30 30 30-30	30 37 00 16 D3 A8 77	...00000007...w
0000-0170	00 00 00 00 0E 0C 02 04-00	30 30 30 30 30 30 30	00000000
0000-0180	34 00 20 D3 A8 0A 00 00-00	00 18 0C 02 04 00 FF	4.....
0000-0190	00 00 00 00 00 00 04 24-05	05 00 06 20 03 D4 03	S.....
0000-01A0	52 00 10 D3 A9 C7 00 00-00	30 30 30 30 30 30 30	R.....00000000
0000-01B0	37 00 82 D3 A6 B8 00 00-00	F7 07 B8 00 00 23 01	7.....00000000
0000-01C0	01 05 F6 28 40 00 05 00-00	03 00 00 E8 03 00 00	...{.....
0000-01D0	00 00 00 00 00 00 00 64-00	00 00 00 00 00 00 00	d.....
0000-01E0	96 00 00 00 00 00 00 00-00	00 00 00 21 07 08 E0	t.....
0000-01F0	00 0F 00 05 05 21 1C 07-CC	0C 0F 00 00 01 00 00	l.....
0000-0200	00 00 00 00 00 00 00 00-00	01 00 00 00 00 00 00	.....
0000-0210	00 00 00 21 10 02 40 00-0F	0E 00 00 00 17 00 00	...l...0.....
0000-0220	00 BA B4 90 87 21 0C 03-40	00 8F 0D 00 00 00 0D	l...0.....
0000-0230	00 00 00 00 64 D3 EE 0A-00	00 00 70 0E 00 00 00	...d.....p.....
0000-0240	00 70 00 00 4C 00 00 00-00	00 00 21 08 00 00 00	...p...L.....t.....
0000-0250	00 00 00 00 81 40 00 00-00	00 00 64 00 00 00 32	0...d...d...2
0000-0260	00 00 00 96 00 00 00 64-00	00 00 64 00 00 00 00	d...d...d...
0000-0270	00 00 00 00 00 00 00 64-00	00 00 00 00 00 00 64	d...d...d...d
0000-0280	00 00 00 64 00 00 00 00-00	00 00 64 00 00 00 64	...d...d...d...d
0000-0290	00 00 00 00 00 00 00 00-10	D3 A9 B8 00 00 00 30	0.....
0000-02A0	30 30 30 30 30 30 37 00-10	D3 A9 C6 00 00 00 30	00000007.....0
0000-02B0	30 30 30 30 30 30 32 00-10	D3 A9 A8 00 00 00 30	00000002.....0
0000-02C0	30 30 30 30 30 30 31		00000001

Figure 5: Under OS/2 1.2, the HOUSE.MET file is 711 bytes long.

Environments

possible—though not exactly easy—to decompose the metafile into its components and edit them. It would even be possible to scan through a metafile and generate C code that calls GPI functions to re-create the image encoded in the metafile.

METAFILES AND SEGMENTS

In the June 26, 1990, edition of *Environments*, I described GPI segments. Graphics segments are quite closely related to metafiles. In fact, the content of a graphics segment is the same as the content of the Graphics Data record that I described above (with the exception of the record header information). However, metafiles contain more information than segments do; in particular, they contain graphics environment information such as the color table and presentation page units. (More on this shortly.)

Do you remember the `GpiSetStopDraw` function I used in the `THREADS3` program in the June 26, 1990, issue? `GpiSetStopDraw` allows a program to halt render-

ing of a graphics segment from another thread of the program. This function also works with `GpiPlayMetaFile`.

There are some GPI drawing functions that are not stored in segments and are not stored in metafiles either. Mostly, these are the various query functions (such as `GpiQueryColor`) that would have no effect when the segment or metafile was actually rendered. Other functions are not stored in segments but affect the metafile's environment records. (Again, more on this shortly.)

Unfortunately, some very important GPI functions are "not metafileable." Storing font information in a metafile is a particular problem because fonts are very device dependent. Perhaps this will change when the vector font system known as `TrueType` is added to `OS/2 2.0`.

METAFILE PLAY OPTIONS

`GpiPlayMetaFile` has seven parameters, but in the `METAFILE` program I used only the first two. The rest were set to `NULL` or 0. The seven parameters to `GpiPlayMetaFile` are

- the presentation space handle;
- the metafile handle;

- the number of elements in the fourth parameter;
- an array of options;
- a reserved parameter that must be set to `NULL`;
- the length of the buffer in the last parameter; and
- a pointer to a character buffer.

If the next-to-last parameter is set to a nonzero value, then the buffer pointed to by the last parameter receives the ASCII description of the metafile specified in the `pszComment` field of the `DEVOPEN-STRUC` structure originally used to open the metafile device context.

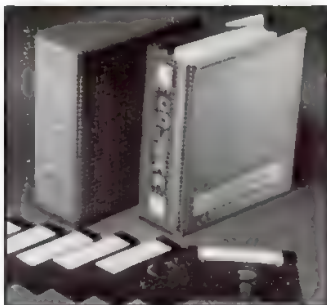
The options in the fourth parameter are encoded in an array of up to ten values. Of course, the `PMGPI.H` header file has lots of identifiers defined for setting these options. The options indicate whether the graphics environment information in the metafile is to be used when the metafile is rendered on an output device or whether the application can define the attributes instead. By default, `GpiPlayMetaFile` uses the application-defined attributes rather than those in the metafile.

These attributes affect several characteristics of the resultant picture. For exam-

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ple, at the time a program begins creating a metafile image, the current viewing transform (set with `GpiSetViewingTransform-Matrix`) is stored in the environment section of the metafile. A program that plays the metafile can use this viewing transform in the metafile or set its own before playing the metafile. The viewing transform can scale, translate, shear, or rotate the image. This is how the Display Picture program included with OS/2 1.2 can scale a metafile to the size of its window. A program that plays a metafile also has control over the color table and local ID's for bitmaps and fonts.

Another option affects the page units. Page units of `PU_LOENGLISH` are stored in the environment section of `HOUSE.MET`, but as noted, `GpiPlayMetaFile` uses the application-set attributes by default. The page units in effect for the presentation space from `WinBeginPaint` are `PU_PIXELS`. Thus the metafile is displayed 100 pixels wide by 150 pixels high.

Now try this. Define a static array in `ClientWndProc`:

```
static LONG alPlayOptions [10] ;
```

Making the array static results in all the elements being initialized to zero for the default options.

During the `WM_PAINT` message, before calling `GpiPlayMetaFile`, set one of the elements of this array:

```
alPlayOptions [PMP_RESET] =  
RES_RESET ;
```

This indicates that the presentation space is to be reset with the page units and page size encoded in the metafile when it was created. Now call `GpiPlayMetaFile` like this:

```
GpiPlayMetaFile (hps, hmf, 10L,  
alPlayOptions, NULL, 0L, NULL) ;
```

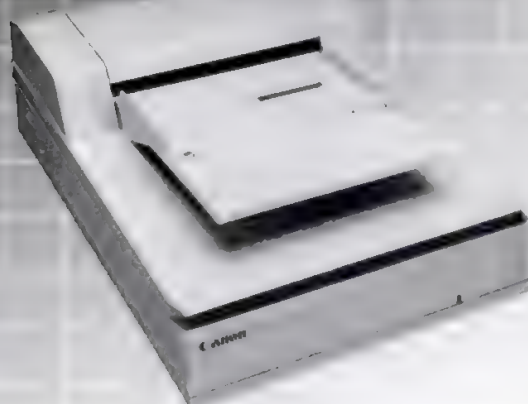
Recompile and run `METAFILE`; you'll see a house 1-inch wide and 1.5-inches high (some monitors may not show this exact size), regardless of video resolution.

MAGNET, ANYONE?

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CIRCLE 158 ON READER SERVICE CARD

by
William S. Hall

Windows

CREATING MULTIPLE CONFIGURATIONS

Booting *Microsoft Windows 2.0* with different configurations seems to stump quite a few people. But there's really a simple solution. During setup, the graphics display and input device choices affect only two files, namely WIN200.BIN and WIN200.OVL. Therefore, the simplest approach is to perform the *Windows* setup operation, stopping at the point of printer selection. (Since the WIN200.BIN and WIN200.OVL files have been created at this point, stopping here saves a considerable amount of time.) Copy the WIN200.BIN and WIN200.OVL files to their own subdirectory (don't do this in the directory where your operating copy of *Windows* exists) and erase all files in the *Windows* setup subdirectory. Repeat this process for all of the combinations you want to set up; it takes only 2 or 3 minutes to complete each setup pass, including storing the files. The resulting files occupy roughly 500K, so two sets can be stored on a 1.2MB floppy (as a safe backup), and several sets can be placed within a subdirectory on a hard disk.

Now, when you start *Windows* and want to change your graphics display and input device, simply copy the desired set of WIN200.BIN and WIN200.OVL files to your operating directory. This is a very quick process and it gives you greater flexibility when working under *Windows 2.0*.

Edmund H. Conrow
El Segundo, California



I've received many questions and suggestions concerning multiple setups for *Windows 2.0*. The only addition I'd make to Mr. Conrow's idea is to include the file WINOLDAP.GRB with each set of WIN200.BIN and WIN200.OVL. This grabber file is created on each pass through Setup. It supports old applications that need the full screen to run and is display dependent. If you use different displays, you may also want to install other typographic fonts. Just remember, the EGA and Hercules use the fonts with a

■ **CREATING MULTIPLE CONFIGURATIONS:** Here are two ways to arrange multiple setups in *Windows 2.0*.

■ **MORE MULTIPLE SETUPS:** And one more method for creating alternate configurations in *Windows*.

■ **REAL MODE AND THE SWAPDISK PARAMETER:** How to fix a misplaced swapdisk parameter in *Windows 3.0*.

■ **STARTING WINDOWS 2.0 WITHOUT THE LOGO:** How to make the Microsoft logo disappear.

■ **GETTING RID OF DOS:** Starting *Windows* without the executive.

B in the name such as COURB.FON and HELVB.FON, the VGA and Olivetti/AT&T monochrome adapters use fonts with an E, and the CGA needs A fonts.

This technique requires a fair amount of disk space, but it's easier to manage than another method known as the *slow boot* (so it is called because the *Windows*' system files must be loaded one by one from the disk). If you choose the slow boot, however, you'll find you can arrange *Windows/286* for the most versatile selection of hardware and software. It's also useful if you have keyboards in several languages. But be forewarned: this method may require you to resolve some filename conflicts, and you'll probably need to create a lot of batch files to build a system.

We can only touch on some of its as-

pects here. So to make it simple, let's begin with what you need if you have *Windows 2.0*, a Microsoft mouse, an EGA display with more than 64K of memory driving an enhanced color monitor or its equivalent, a U.S. keyboard, and a machine that's reasonably compatible with IBM computers. Later we'll show you how to move to other configurations.

Begin in a clean directory. Start by copying KERNEL.EXE and GDI.EXE from your *Windows/286* distribution disks. If you have some extended memory and use HIMEM.SYS, copy USERF.EXE and rename it to USER.EXE. Otherwise, copy USERS.EXE and rename it to USER.EXE.

Next, enter the following to create dummy WIN200.BIN and .OVL files:

```
echo win200.bin > win200.bin
echo win200.ovl > win200.ovl
```

The actual contents of these two files are immaterial, but the files themselves must be present.

Now, copy the basic drivers (SYSTEM.DRV, SOUND.DRV, MOUSE.DRV, and COMM.DRV) to your directory. Several files will need to be copied and then renamed as follows:

Copy	Rename to
EGAHIRES.DRV	DISPLAY.DRV
KBDUS.DRV	KEYBOARD.DRV
HIFONT.FON	FONT.S.FON
FONTHIUS.FON	OEMFONTS.FON

Finally, copy MSDOS.EXE and MS-DOSD.EXE. Now just type the command KERNEL. You should find yourself in *Windows* running MS-DOS.

From the above, you can probably see how to rig new configurations. To use different displays, you need only copy the correct screen driver to DISPLAY.DRV. (Of course, we assume that you won't do something weird like trying out HERCULES.DRV on your 8514/A adapter).

You can also experiment with different-

Windows

size system fonts. For example, if you use an Olivetti or AT&T 640-by-400 monochrome display and have good eyes, copy ATTDC.DRV to DISPLAY.DRV and FONTHI.FON to FONTS.FON. You may like that you'll have more information on the screen than is provided in the standard setup, which uses FONTSQ.FON, designed for the VGA.

To switch pointing devices, copy the appropriate driver to MOUSE.SYS. Since this is also the name of the Microsoft mouse driver, you may want to rename the Microsoft driver to MSMOUSE.SYS, to avoid overwriting it. Then you can copy your other driver to MOUSE.SYS. Some machines work best with their own system drivers. Copy SYSTEM.DRV to MSSYSTEM.DRV, and then copy the appropriate driver for your machine to SYSTEM.DRV. For example, Olivetti and AT&T machines use ATTSYS.DRV.

To complete your slow boot installation, you'll need to copy over WIN.INI and install typographic fonts and printers using the Control Panel. Be sure to match the fonts with your printer needs. One way to figure this out is to read through SETUP.INF to determine machine, printer, and font requirements. And only if you plan to use standard applications from *Windows* will you need WINOLDAP.MOD and the necessary grabber file. For example, the high-resolution EGA driver requires EGAHIRES.GRB, which you should rename to WINOLDAP.GRB.

Both the multiple-installation method and the slow boot method can be extended to *Windows/386*, but that's a bit more complicated. Let me know if you need this information. The next letter offers yet another way to accomplish multiple setups in *Windows 2.0*.

MORE MULTIPLE SETUPS

When you run *Windows*, you execute WIN.COM, but the file it actually loads is WIN200.BIN. This name is embedded in WIN.COM and is located at offset 0FFh from the beginning of the file. So, each time you run Setup and create WIN.COM, WIN200.BIN, and WIN200.OVL, you could rename them to, say, WINXYZ.COM, WINXYZ.BIN, and WINXYZ.OVL, where XYZ is unique for each. Then, using DEBUG or another hex editor, you'd change the reference in WINXYZ.COM from WIN200.BIN to WIN-

XYZ.BIN. Each group of these three files then serves to run a version of *Windows* with a different hardware configuration.

Don Cue
Des Moines, Iowa



This approach is definitely for the more adventurous. If you try it, the only problem you might run into may be with WINOLDAP.GRB. As noted above, a different grabber may be required if the display changes. You can find out which grabber is needed for a given display by reading SETUP.INF. Note that some grabbers are multipurpose; in particular, the VGA and EGA in the color modes use the same grabber.

REAL MODE AND THE SWAPDISK PARAMETER

When I run real-mode *Windows 3.0* on my AT and execute a DOS application, I find that I can then switch back to *Windows* with no problem. But if I run a second DOS program, I must close it before switching back to *Windows*. I have set the swapdisk parameter in WIN.INI to a disk with several megabytes of space, but I never find anything saved there. Is this a bug?

Sonja Simakova
Ceske Budejovice
Czechoslovakia



No, it's not a bug; let's call it an oversight. One of the very nice features of *Windows 3.0* is its support of old applications in real and standard modes. Now instead of trying to coexist with standard applications, *Windows* just gets out of the way, leaving behind a small footprint in memory so it can reload itself. But some portion of the *Windows* memory image must be saved somewhere when the old application runs. Similarly, if you decide to context-switch back to *Windows*, the corresponding DOS image must also be set aside.

These saved images are placed in the location specified by swapdisk—provided this parameter is set in SYSTEM.INI, not WIN.INI. Using SYSEDIT, NOTEPAD, or some other ASCII text editor, look in WIN.INI under the [windows] section for the swapdisk parameter and delete it. Next, open SYSTEM.INI, find [NonWindowsApp] and enter swapdisk= under it. If there's no swapdisk parameter in SYSTEM.INI, the TEMP environment variable (if it exists) determines the location. TEMP is used by *Windows* to store a variety of temporary files

and—ideally, for speed—should point to a fairly large RAM disk.

A RAM disk may sound like an ideal place to store these images. In reality, though, the image files will be competing for the TEMP space. Since they are usually quite large—400K to 600K—you won't be able to run very many DOS programs from *Windows* unless the TEMP area is substantial. For example, a 1MB RAM drive will support one DOS program that can be context-switched with *Windows*. Two DOS programs can be run, but it isn't possible to context-switch; you must exit the DOS program before moving back to *Windows*. On the other hand, the speed of the context-switch is very fast.

You can give up speed for space. Just point swapdisk to a hard disk with enough room. You'll find that more DOS images can be run, though context-switching is noticeably slower. However, 3MB of swapdisk space will allow you to run half a dozen DOS programs simultaneously from *Windows* in real or standard mode.

If neither the swapdisk parameter nor TEMP variable is given, then the images are put into the root directory of drive C:. Image files have the hidden attribute set and have names like -WOA1234.TMP. WOA stands for Windows Old Applications. You can see them from DOS if you have a directory program that shows hidden files. From *Windows*, you can use the File Manager, which will allow you to view all files and their attributes if you select File Details under View and set the appropriate options under Include.

You can no longer use swapdisk=/E when in real mode to specify expanded memory (which didn't work in *Windows 2.03* anyway).

STARTING WINDOWS 2.0 WITHOUT THE LOGO

I don't like seeing the logo when I run *Windows 2.0*. So I created a batch file that contains the line win %1. Now to bypass the logo, I just run this batch file.

Gary Kuever
St. Louis, Missouri



It's amazing how many readers prefer skipping the logo when they run *Windows* and have suggested various means for avoiding it. If you simply type win followed by a space, the logo will not appear, and MS-DOS will run. If you execute Mr. Kuever's batch file and pass no parameters, you get the equivalent of typing win and a space. You can also

Windows

type the name of a *Windows* 2.0 application on the command line, for example `win write`, and the logo will be suppressed, MS-DOS will load as an icon, and `WRITE` will run. In *Windows* 3.0, just type `win` followed by a space and a colon (`win :`).

Although running *Windows* without displaying the logo seems harmless enough, doing so with some configurations can cause real problems you'd rather avoid. I use a dual monitor setup on my own machine; I like editing source programs on the monochrome monitor, which is connected to a Hercules card. For *Windows*, I have a VGA adapter attached to a multiscanning display. I can easily switch from one monitor to the other using the DOS mode command. But if I run *Windows* when the monochrome display is active and take some action that suppresses the logo, then I crash. If I just type `win`, everything loads correctly. The reason for this is that the logo code actually performs an additional service: modifying the DOS equipment

flag located in the ROM data area at 40:10h to indicate that a color display is available. Otherwise, the *Windows* display driver's call to switch to graphics mode may fail. Later, when *Windows* exits, the remnant of the logo code restores the flag.

The following letter shows how you can even get rid of the *Windows* executive, MS-DOS!

GETTING RID OF DOS

The memory taken by MS-DOS can be quite valuable to a large application like *Microsoft Excel*. Furthermore, if you're already using a third-party *Windows* shell such as *CBM Desktop* or *Distinct Corp.'s File Manager*, MS-DOS is not even needed. Here's a way you can get rid of the *Windows* executive, MS-DOS.

Suppose you want to run *Excel* and suppress the executive from *Windows/286*. Just type `win :excel`. *Excel* will load, and when you exit, you'll be back in DOS. You can try this with any *Windows* program; the technique is the basis for the so-called runtime version of *Windows*, which is supplied by a number of vendors.

Gary Gerber
Foster City, California



And now for the caveats. Unless the program provides some services, as do *Excel* and *PageMaker* on their system menus, you can't get to the Control Panel, Spooler, Clipboard, or other tools you may need. And finally, here's an interesting situation. (You'll need to reboot after trying this one.) In your *Windows* 2.0 directory, type `win :control`. The Control Panel will then load and you can use it normally. Now try to exit. The Control Panel will close, but you'll still be in *Windows* with no way of getting out. Apparently, the Control Panel application fails to respond to the usual sequence of termination messages from *Windows*, and if it's the last application running, *Windows* will not close down.

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 ing the code yourself or using the

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 for a screen does not exist at the cursor...
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Relational querying	(75)	()	Good	Poor	Good	Excellent	Excellent	Excellent
Relational reporting	(100)	()	Excellent	Very Good	Very Good	Very Good	Excellent	Excellent
Programming language	(100)	()	Excellent	Very Good	Very Good	Excellent	Excellent	Excellent
Speed of relational operations	(125)	()	Very Good	Good	Excellent	Satisfactory	Very Good	Satisfactory
Documentation	(100)	()	Very Good	Satisfactory	Excellent	Excellent	Excellent	Excellent
Ease of learning	(50)	()	Excellent	Poor	Good	Very Good	Excellent	Excellent
Ease of use	(125)	()	Excellent	Unacceptable	Very Good	Very Good	Excellent	Very Good
Error handling	(100)	()	Good	Good	Satisfactory	Very Good	Excellent	Satisfactory
Support	(25)	()	Good	Poor	Very Good	Very Good	Very Good	Very Good
Support policies	(50)	()	Excellent	Poor	Satisfactory	Very Good	Very Good	Very Good
Technical support	(75)	()	9.0	4.0	7.7	7.6	9.5	8.8
Value								
Final scores								
Use your own weightings to calculate your score								

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edited by
Trudy Neuhaus

Databases

DATE CONVERSION

This is a user-defined function that converts a date expression in *dBASE IV* into a more readable version. I use this simple function with all of my code; it makes any computer-generated report more personable.

```
FUNCTION cdate
PRIVATE mdate
PARAMETER mdate
RETURN (CMONTH(mdate) + " " +;
LTRIM(STR(DAY(mdate),2)) +;
" " + STR(YEAR(mdate),4))
```

For example,

```
mbirth = CTOD("3/10/61")
? CDATE(mbirth)
* Result: March 10, 1961
```

This also can be expanded to include other information such as the day of the week.

Benjo Dans
Saginaw, Michigan



Indeed, date functions like this one are a mainstay in most programmers' *dBASE* toolkits. Many variations on this theme are possible. For example, to create a function that also returns the day of the week, replace the RETURN statement above with the following:

```
RETURN (CDOW(mdate) + ", " +;
CMONTH(mdate) + " " +;
LTRIM(STR(DAY(mdate),2)) +;
" " + STR(YEAR(mdate),4))
```

The resulting function works like this:

```
mbirth = CTOD("3/10/61")
? CDATE(mbirth)
* Result: Friday, March 10, 1961
```

Or, if you need a shorter version for a report with space limitations, try

```
RETURN (SUBSTR(CMONTH(mdate),1,3) +;
" " + LTRIM(STR(DAY(mdate),2)) +;
" " + STR(YEAR(mdate),4))
```

■ **DATE CONVERSION:**
Here's a UDF that converts a *dBASE* date expression into everyday format.

■ **CONVERTING NUMBERS TO WORDS:** A *FoxBASE* program that converts numeric expressions into their English equivalents.

■ **LEFT-PADDING WITH ZEROS:** A combination of *dBASE* functions lets you left-zero-pad a numeric field.

which works like

```
mbirth = CTOD("3/10/61")
? CDATE(mbirth)
* Result: Mar 10, 1961
```

FoxPro users can use a built-in function called MDY, which returns the date in the first format above. However, the year portion is dependent on the SET CENTURY setting. For example, MDY(mdate) returns "March 10, 61" with SET CENTURY OFF (note that "19" is missing). In addition, CENTURY defaults to OFF.

To ensure a complete four-digit year, you may be tempted to build a UDF that locks in the century setting:

```
FUNCTION mymdy
PARAMETERS mdate
PRIVATE savecen, rdate
savecen = SET("century")
SET CENTURY ON
rdate = MDY(mdate)
SET CENTURY &savecen
RETURN rdate
```

This saves and restores the current century setting while returning a date guaranteed to

have four digits. However, you'd be well advised to resist any such temptation, since Mr. Dans's much shorter CDATE function executes about 15 times faster than mymdy and accomplishes the same thing.

CONVERTING NUMBERS TO WORDS

I'm submitting a *FoxBASE* 2.01 program that converts a numeric amount to its English equivalent—a facility necessary in my invoicing program.

Alfredo Conde
MIA Airport, Philippines



A common application for this technique is printing checks. Mr. Conde's original version worked quite well, but only for amounts up to \$999,999.99. Such a limitation won't do! The N2W procedure in Figure 1 has been changed so that it works with numbers up to \$999,999,999,999.99 (just in case you'd like to place a deposit against the national debt). In tests against a file of 50 random numbers, it worked fine.

To see how it works, try the following example:

```
SET PROC TO NWORDS
? N2W(150.99)

* Result is:
* One Hundred Fifty Dollars and
* 99/100
```

You should note that this routine works in *FoxBASE+*. It does not work in current releases of *FoxPro* (through 1.2).

LEFT-PADDING WITH ZEROS

Recently I faced a perplexing *dBASE* problem. My client wanted a database unloaded in SDF (System Data Format) with all numeric fields zero-padded to the left of the most significant digit. How easy, I thought. Simply define the field as character data and use the STR() function to convert any numeric data to character data. But the

Databases

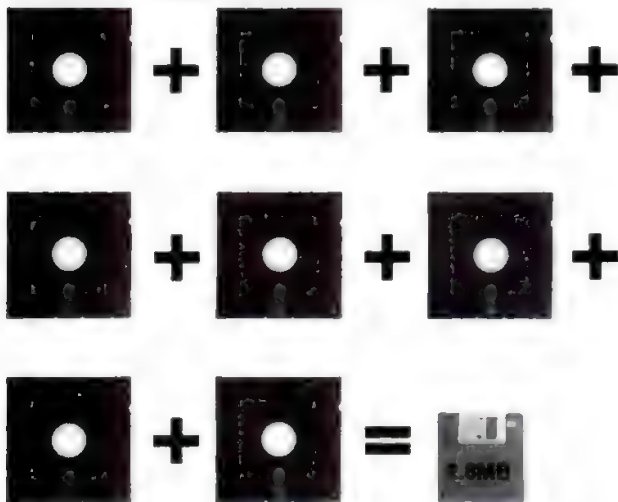
```

NWORDS.PRG
1 of 2

*****
* NWORDS.PRG
* Convert numbers to words
*****
PROCEDURE NZW
PARAMETERS n_number      ** pass numeric value
* Return "Invalid number" if out of range
IF (n_number <= 0) .OR. (n_number > 999999999999.99)
    RETURN "Invalid number"
ENDIF
* Initialize
word = {}
orig = n_number
cents = (n_number - INT(n_number))*100
* If less than $1.00, start with "Zero"
IF INT(n_number) = 0
    word = {Zero}
ENDIF
* Set Up Arrays
DIMENSION mone(19), sten(9)
mone(1) = {One}
mone(2) = {Two}
mone(3) = {Three}
mone(4) = {Four}
mone(5) = {Five}
mone(6) = {Six}
mone(7) = {Seven}
mone(8) = {Eight}
mone(9) = {Nine}
mone(10) = {Ten}
mone(11) = {Eleven}
mone(12) = {Twelve}
mone(13) = {Thirteen}
mone(14) = {Fourteen}
mone(15) = {Fifteen}
mone(16) = {Sixteen}
mone(17) = {Seventeen}
mone(18) = {Eighteen}
mone(19) = {Nineteen}
sten(1) = {Ten}
sten(2) = {Twenty}
sten(3) = {Thirty}
sten(4) = {Forty}
sten(5) = {Fifty}
sten(6) = {Sixty}
sten(7) = {Seventy}
sten(8) = {Eighty}
sten(9) = {Ninety}
* Handle billions
x = INT(n_number/1000000000)
IF x > 0
    DO skwords WITH x, word
    word = word + {Billion}
ENDIF
n_number = n_number - (x * 1000000000)
* Handle millions
x = INT(n_number/1000000)
IF x > 0
    DO skwords WITH x, word
    word = word + {Million}
ENDIF
n_number = n_number - (x * 1000000)
* Handle thousands
x = INT(n_number/1000)

```

Figure 1: This procedure converts numbers into their English equivalents.

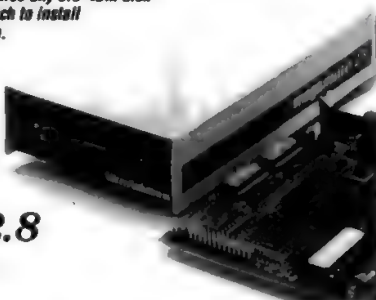


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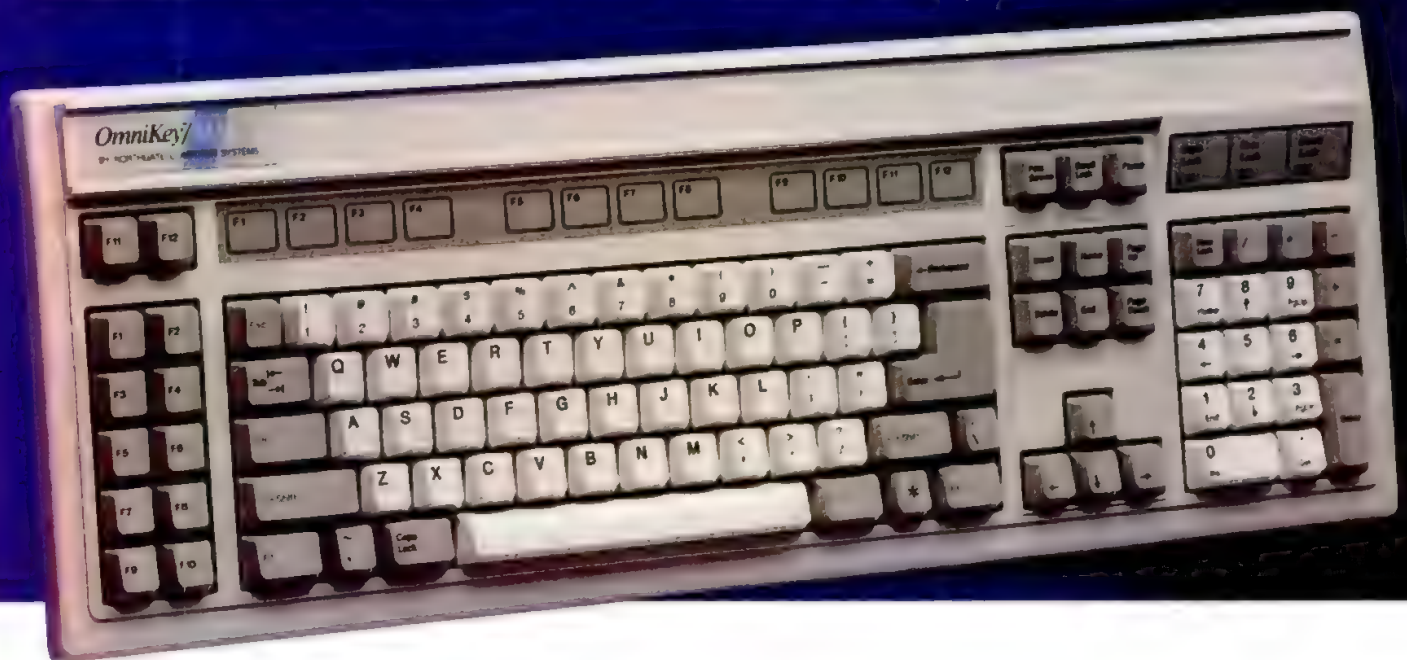
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NWORDS.PRG

2 of 2

```

IF x > 0
  DO mkwords WITH x, word
  word = word + [Thousand ]
ENDIF
n_number = n_number - (x * 1000)
*
* Handle the rest
*
IF n_number >= 1
  DO mkwords WITH INT(n_number), word
ENDIF
*
* Setup "dollars" and cents
*
IF orig >= 2 .OR. int(orig) = 0
  word = word + [Dollars and ]
ELSE
  word = word + [Dollar and ]
ENDIF
IF cents > 0
  IF cents < 10
    word = word + '0' + STR(cents,1) + [ /100]
  ELSE
    word = word + STR(cents,2) + [ /100]
  ENDIF
ELSE
  word = word + [00/100]
ENDIF
RETURN word
*
* Procedure: MAKE_WORDS
*
PROCEDURE mkwords
PARAMETERS numb, string
PRIVATE nstr, nlen, nlook

```

```

nstr = STR(numb)
DO WHILE SUBSTR(nstr,1,1)=' '
  nstr = SUBSTR(nstr,2)
ENDWHILE
DO WHILE (** <> nstr)
  nlen = LEN(nstr)
  nlook = VAL(SUBSTR(nstr,1,1))
  IF nlook = 0
    IF nlen = 1
      nstr = ''
    ELSE
      nstr = SUBSTR(nstr,2)
    ENDIF
  ENDIF
DO CASE
CASE nlen = 1
  string = string + mone(nlook)
  string = string + "Hundred "
  nstr = SUBSTR(nstr,2)
CASE nlen = 2
  IF VAL(SUBSTR(nstr,1,2)) < 20
    string = string + mone(VAL(SUBSTR(nstr,1,2)))
    nstr = ''
  ELSE
    IF VAL(SUBSTR(nstr,1,2)) >= 20
      string = string + mten(nlook)
      nstr = SUBSTR(nstr,2)
    ENDIF
CASE nlen = 1
  string = string + mone(nlook)
  nstr = ''
ENDCASE
ENDDO
RETURN
* eof

```

STR() function doesn't left-zero-pad. So I came up with a technique that combined the STR(), SUBSTR(), and STUFF() functions. The example that follows will left-zero-pad a seven-position field containing the number 257:

```

STORE STR(257,7) to x
STORE 1 to I
DO WHILE I <= 7
  IF SUBSTR(x,i,1)=' '
    STORE STUFF(x,i,1,'0') to x
  ENDIF
  STORE I+1 to I
ENDDO

```

Terry Blankenship
Brentwood, Tennessee



Numeric formatting is a more common operation required by many business programs. This technique does the job but may be shortened. It can be made to work with any length string by including the SUBSTR comparison as part of the DO WHILE loop:

```

STORE 1 to I
DO WHILE SUBSTR(x,i,1)=' '
  STORE STUFF(x,i,1,'0') to x
  STORE I+1 to I
ENDDO

```

If your dBASE implementation supports user-defined functions, you can create one to do the converting and padding like this:

```

*
* PROCEDURE ZNUM(number, slen)
*
* This function converts a number
* to a string of length slen left
* padded with leading zeroes.
* Returns the string.
*
PROCEDURE INUM
PARAMETERS number, slen
STORE 1 to I
STORE STR(number, slen) to string
DO WHILE SUBSTR(string,i,1)=' '
  STORE STUFF(string, i, 1, '0') to
  string
  STORE I+1 to I
ENDDO
RETURN string

```

To use ZNUM in your program, you could type

```

string = ZNUM(257, 7)

* "0000257"

```

Readers will be interested to note that Fox Software's *FoxPro* includes built-in func-

tions called PADL, PADR, and PADC to left-pad, right-pad, and center-pad, respectively. If you're using *FoxBASE+*, here's a handy emulation of *FoxPro*'s PADL function:

```

*
* PROCEDURE PADL(string, length,
* padchar)
*
* This UDF left pads a string to
* length characters padding with
* character padchar. It is similar
* to FoxPro's PADL in that it
* truncates the string if the
* string is longer than length, and
* does not trim leading or trailing
* blanks on the incoming string.
*
PROCEDURE PADL
PARAMETERS string, length, padchar
IF LEN(string) > length
  STORE SUBSTR(string,1,length) TO
  string
ENDIF
DO WHILE LEN(string) < length
  STORE padchar + string TO string
ENDDO
RETURN string

```

The PADL function accepts three arguments: the string to pad, the desired length,

Databases

and the character to use for padding. You could use it in your programs like this

```
string1 = PADL("257",7,"0")

* string1 = "0000257"

string2 = PADL("257",7," ")

* string2 = "    257"
```

If you're using *dBASE IV* or *FoxPro*, another alternative is the **TRANSFORM** function. This function lets you apply PIC-

FoxPro includes built-in functions that enable users to left-pad, right-pad, and center pad.

TURE formatting to character, logical, date, and numeric data and returns the resulting string.

The function codes for leading zeros and right justification are L and R respectively, so the following does the trick:

```
string1 = TRANSFORM(257,"@LR
9999999")

* string1 = "0000257"
```

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Research for this article was provided by Salvatore Ricciardi, a New York-based consultant and frequent contributor to *PC Magazine*.

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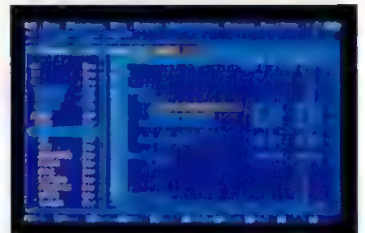
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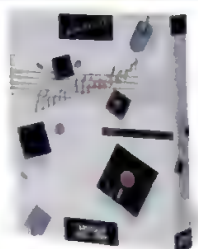
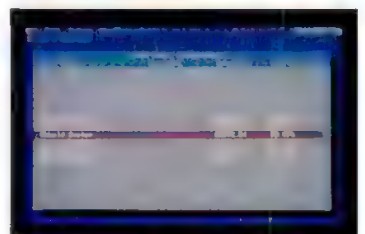
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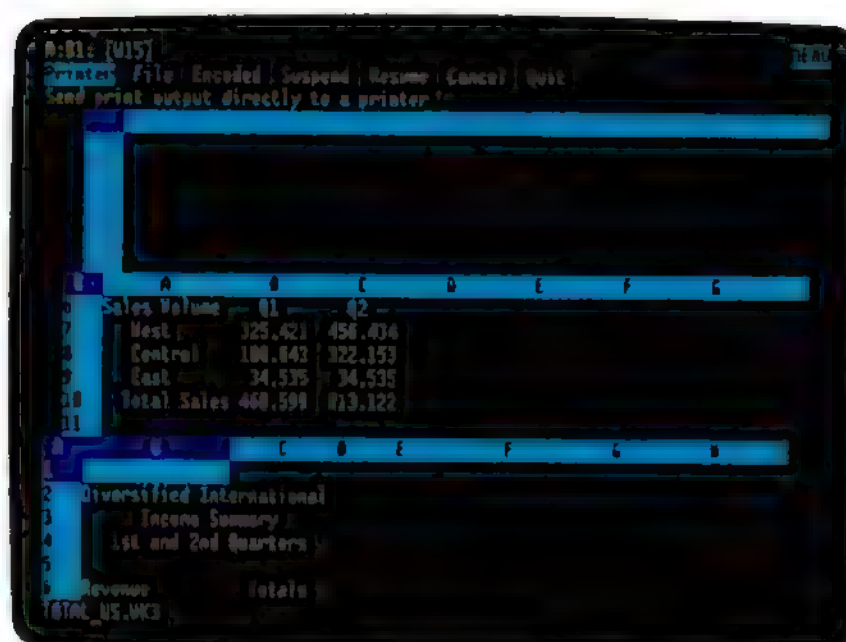


The Engineer



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CIRCLE 285 ON READER SERVICE CARD

by
Craig Stinson

Spreadsheets

DUPLICATING @D360 IN EARLIER VERSIONS OF LOTUS 1-2-3

Our firm uses a 30-day month and a 360-day year in calculating future values on many of our municipal bond projects. We can use the @D360 function in *Lotus 1-2-3*, Release 3, to determine the difference between two dates, but many of our users prefer 1-2-3, Release 2.01 or *Quattro*, neither of which has this function.

For these non-Release 3 users, I wrote the formula

```
(@YEAR(END)-@YEAR(START))*360  
+ (@MONTH(END)-@MONTH(START))*30  
+ @DAY(END)-@DAY(START)+  
@IF(@DAY(END)=31,-1,0)+  
@IF(@DAY(START)=31,1,0)
```

To use it, just assign the name END to your ending date and START to your starting date. The formula returns exactly the same result as Release 3's @D360.

Kevin Fisher
Sicklerville, New Jersey



The 360-day year, an artificial construct commonly used in compound interest calculations, assumes that each month is comprised of exactly 30 days. Using this artificial calendar, the @D360 function in *Lotus 1-2-3*, Release 3 (and in 1-2-3/G), returns the difference in days between a start and an end date. Mr. Fisher's formula neatly duplicates the @D360 function.

The formula is less complicated than it appears—it simply adds five terms together. Let's break it apart and look at each term separately. For an example, we'll calculate the difference between November 16, 1991, and August 31, 1990, on the 360-day calendar.

The first term

```
(@YEAR(END)-@YEAR(START))*360
```

finds the year component of each date and multiplies the difference between those components by 360. In our example, the

■ **DUPLICATING @D360 IN EARLIER VERSIONS OF LOTUS 1-2-3:** Find the difference between two dates in a 360-day year.

■ **DISTINGUISHING BLANKS FROM LABELS IN 1-2-3 FORMULAS:** Using @CODE and null labels are just two solutions.

■ **USING MULTIPLE CONFIGURATION FILES:** With the help of batch files, you can start *Lotus 1-2-3* with different default settings.

year components are 1991 and 1990, the difference between them is 1, and 1 times 360 is 360.

The second term

```
(@MONTH(END)-@MONTH(START))*30
```

finds the month component of each date and multiplies the difference between those components by 30. In our example, the month components are 11 (November) and 8 (August), the difference between them is 3, and 3 times 30 is 90.

The third term

```
@DAY(END)-@DAY(START)
```

simply returns the difference between the day components of the two dates. In our example, the day components are 16 and 31, and the difference is -15.

In our model, we've noted that a month consists of 30 days. As a consequence, if our ending date is the 31st of any month, we'll want to correct the result of the formula by subtracting one day. In other words, we'll treat the 31st of any month as

though it were the 30th. To make this correction, our fourth term

```
@IF(@DAY(END)=31,-1,0)
```

returns -1 if the ending date is the 31st of any month and 0 otherwise. Since our ending date is November 16, this @IF function returns 0.

We'll need to make a similar correction if our starting date is the 31st of any month. In this case, however, we'll want to add, instead of subtract, 1. The formula's fifth term

```
@IF(@DAY(START)=31,1,0)
```

performs the correction. Our start date is in fact the 31st (of August), so the last term in our formula produces a 1.

In our example, then, Mr. Fisher's formula boils down to

```
360 + 90 + -15 + 0 + 1
```

which is equivalent to 436. And this number is indeed the result you would get by applying the @D360 function in 1-2-3, Release 3.

Now the only difficulty with Mr. Fisher's formula is that you have to type it. The best way to avoid keyboard drudgery (and mistakes) is to create a macro that writes the formula. Put the macro into your macro library and call it up whenever you need to work with 360-day years.

One of the benefits offered by *Microsoft Excel*—and not by any version of 1-2-3—is its ability to encapsulate lengthy formulas of this sort into user-defined functions. Figure 1 shows how you could create your own D360 function in *Excel*.

Just enter the ten lines of Figure 1 in a macro sheet and assign the name DAY360 to cell A2. Note that you can't name the function D360, because D360 is the address of a worksheet cell. To use this function, you must prefix the function name with the name of its macro sheet and an exclamation point. So if the macro sheet

Spreadsheets

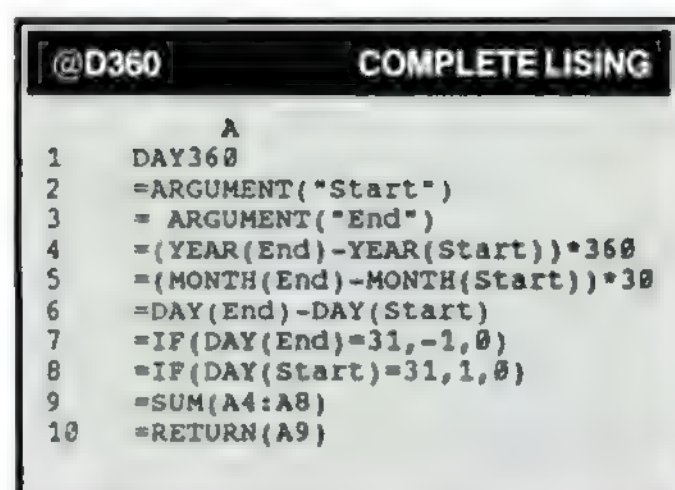


Figure 1: This user-defined *Microsoft Excel* function returns the difference between two dates, according to a 360-day, 12-month calendar.

were named MYFUNCS.XLM!, you would use

MYFUNCS.XLM!DAY360

Follow this statement with an opening parenthesis, separate your two arguments with a comma, and use a closing parenthesis. Or, to reduce typing, just choose the Paste Function command (on the Formula menu) and choose your function from the dialog box that appears.

DISTINGUISHING BLANKS FROM LABELS IN 1-2-3 FORMULAS

I work with a product database in *Lotus 1-2-3*, Release 3, in which one field is a product code. I use single letters to distinguish various product types; some products are marked A, others B, and so on. A few products have no code at all; for these, the code field is left blank.

I ran into a problem trying to use the code field as the basis for a calculation elsewhere in the worksheet. A formula such as

`@IF(A10="E",C10*D10,0)`

returns C10*D10 even when the code field is blank!

My solution was to use @CODE to get the character number of the product code. This works because @CODE returns ERR if its argument is a blank cell, allowing me to use the following formula:

`@IF(@ISERR(@CODE(A10)),0,C10*D10)`

instead of the first.

In this formula, the @CODE function returns the character value of the product

code. The @ISERR function returns 1 if the @CODE function returns ERR. And the @IF function gives me what I wanted in the first place—0 if the product code is a blank, C10*D10 if the product code isn't blank.

Charles Prokes
Kelowna, British Columbia
Canada



You would have the same problem in *1-2-3*, Release 2.01 or Release 2.2 (but not Release 2.0). All these versions of *1-2-3* treat blank cells and labels as though they had the numeric value 0. When you ask *1-2-3* if a blank cell is equal to E, the program replies yes—because they're both 0.

This solution is fine, although it has a distasteful side effect. If you break out the components of your @IF(@ISERR(@CODE(. . .))) formula into separate

**One benefit of Excel
is its ability to store
long formulas in user-
defined functions.**

cells, you will see ERR values that don't represent mistakes of any kind. Such "benign" ERR values might make it harder for you to spot genuine errors. I have two alternative approaches.

First, instead of using blank (empty) cells to stand for uncoded products, use null labels. In other words, use one of *1-2-3*'s label prefixes (the apostrophe, caret, or quotation mark) without any text. *1-2-3* recognizes that a null label is not equal to the letter E (or any other letter), so your @IF test will give you the results you want.

Alternatively, you could use @CELL to determine whether the code cell is blank. The formula

`@CELL("type",A10)="b"`

returns 1 if A10 is blank (without even a label prefix) and 0 if it is not. Therefore, you can write your complete formula as

`@IF(@CELL("type",A10)="b",0,C10*D10)`

Life would be a little easier, perhaps, if

1-2-3 included an @ISBLANK function as *Excel* and some other spreadsheets do. But at least you can simulate this function with @CELL.

USING MULTIPLE CONFIGURATION FILES

I upgraded to *Lotus 1-2-3*, Release 2.2, partly because of its Undo feature. However, I was dismayed to find that with Undo enabled, I didn't have enough memory left to retrieve my longest and most important worksheets. I tried changing the defaults so that Undo was ordinarily disabled; but then I had to re-enable it each time I wanted to work on a small spreadsheet.

I solved the problem by creating two versions of *1-2-3*'s configuration file, 123.CNF. One version has Undo enabled, the other has it disabled.

First, I used /Worksheet Global Default Other Undo Disable to turn off Undo. I saved the new setting in 123.CNF with /Worksheet Global Default Update. Next, I used /System to go out to DOS and typed

`COPY 123.CNF UNDO-OFF.CNF`

and then returned to *1-2-3* by typing EXIT.

Back in *1-2-3*, I turned Undo on again with /Worksheet Global Default Other Undo Enable, used the Update command (so that 123.CNF would once more be set to start *1-2-3* with Undo), and I quit *1-2-3*.

Back in DOS, I created a batch file, 123UO.BAT, to start *1-2-3* with Undo off. 123UO.BAT has the following commands:

`CD \123
COPY 123.CNF SAVE.CNF
COPY UNDO-OFF.CNF 123.CNF
123
COPY SAVE.CNF 123.CNF`

After logging onto my *1-2-3* directory, this batch file backs up the 123.CNF file, copies my "Undo-off" configuration file to 123.CNF, and runs *1-2-3*. When I quit *1-2-3*, the batch file restores the original 123.CNF file. Now, the next time I type 123, the program will start with Undo enabled. But when I want to work with large worksheets, I execute the program by typing 123UO.

Alan B. Wasser
New York, New York



Mr. Wasser's idea may be useful for others who run *1-2-3* without expanded memory.

Release 2's configuration file, 123.CNF, records all the preferences you

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Spreadsheets

express via /Worksheet Global Default commands—including (among other things) your default data directory, printing margins, currency symbol, international date and time formats, and whether or not you want Undo enabled by default. When you start *1-2-3*, the program reads the 123.CNF file and restores all the default settings that were in effect the last time you used the /Worksheet Global Default Update command.

Unfortunately, you can't keep several .CNF files with different settings and use a command-line parameter to tell *1-2-3* which one you want to use. You can't, for example, type 123 UNDO-OFF.CNF at the DOS prompt and expect *1-2-3* to start with your UNDO-OFF.CNF settings in place. The configuration file must be named 123.CNF, so you need to resort to batch files of the kind used by Mr. Wasser if you want to start *1-2-3* at different times with different defaults.

In this respect, the configuration file differs from the settings file. The settings file, which is also read by *1-2-3* at start-up time, tells *1-2-3* what printer drivers and screen drivers you want to use. The default name for the settings file is 123.SET, but you can use *1-2-3*'s Install program to create as many settings files as you like. Then you can specify the settings file you want by including its name on the command line. For example, if you wanted to run *1-2-3* sometimes with the LICS screen driver and sometimes with the ASCII-No LICS screen driver, you could create two copies of the settings file. The one that installs the LICS driver could keep the default name, 123.SET, and the other one could be named ASCII.SET. To start *1-2-3* with the LICS driver, you'd just type 123. To start with the ASCII driver, you'd type 123 ASCII.

It is important to note that you can also use Mr. Wasser's idea to start *1-2-3* with or without particular add-ins attached. In *1-2-3*, Release 2.2, any add-ins that you attach with the /Worksheet Global Default Other Add-in Set command are recorded in 123.CNF when you use /Worksheet Global Default Update. Consequently, you can create additional copies of your .CNF file with different constellations of add-ins in place.

In *1-2-3*, Release 2.0 and Release 2.01, however, the add-ins you have attached

automatically are recorded in a separate configuration file named ADN.CFG. Suppose, for example, you want to create two copies of this file, one to start *1-2-3* with *Allways*, the other to start it with Person-ics' *Look&Link* add-in. To begin, start *1-2-3* and press Alt-F10 to invoke the Add-in Manager. Type S for Setup, then S for Set. Install *Allways* and use the Add-in Manager's Update command. Once you've exited the Add-in Manager, use /System to go out to DOS, and then type the following command:

```
COPY ADN.CFG ALLWAYS.CFG
```

Type Exit to return to *1-2-3*.

Now you must use the Add-in Manager's Cancel command to remove *Allways* followed by its Set command to install *Look&Link*. Save the new setting with the Update command, go back to DOS, and copy ADN.CFG to LOOKLINK.CFG. As before, return to *1-2-3*, invoke the Add-in Manager's Setup command, remove all add-ins, use the Update command, and then quit *1-2-3*.

At this point you would have three versions of the Add-in Manager's configuration file: ADN.CFG, with no add-ins installed; ALLWAYS.CFG, with *Allways* installed; and LOOKLINK.CFG, with *Look&Link* installed.

A simple way to set up a batch file system for these three configuration variants would be as follows: first make a copy of ADN.CFG and call it VANILLA.CFG; then create three batch files called 123V.BAT, 123A.BAT, and 123L.BAT.

123V.BAT would look like this:

```
CD \123
COPY VANILLA.CFG ADN.CFG
123
```

The other two batch files would be identical, except that 123A.BAT would copy ALLWAYS.CFG to ADN.CFG and 123L.BAT would copy LOOKLINK.BAT to ADN.CFG.

HINTS, TIPS, QUESTIONS

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by
Craig L. Stark

The Working Word

FASTER FONTS

Downloading fonts to a laser printer using *WordPerfect* 5.0 is often an exasperatingly time-consuming process. In our office we initialize our HP LaserJet II with about 20 Bitstream fonts, which total about 600K. When using *WordPerfect* 5.0 on our XT clone, the download time is interminable—half an hour, and sometimes more if we're editing text at the same time.

I noticed that some print jobs moved much faster when I redirected printer output to a file on-disk, so I tried redirecting the Initialize Printer routine and was amazed at the results.

To send the print job to a file, you edit the printer definition by using Shift-F7, **Select Printer**, **Edit**, **Port**, **Other**. When *WordPerfect* asks you to supply a "Device or File-name," type in the name (and path, if appropriate) for the file you will use to save the printer output—for example, \WP50\DOWNLOAD.LJ2.

Exit back to the Print menu and select **Initialize Printer**. When this print job is complete, you'll have a file called DOWNLOAD.LJ2 that is about equal to the total of all the fonts you've downloaded. (The fonts in the DOWNLOAD.LJ2 file will be those you marked with an asterisk in the printer definition; that is, in effect, when you create DOWNLOAD.LJ2.) You then send that file to the printer from DOS using COPY:

```
COPY \WP50\DOWNLOAD.LJ2 PRN /B
```

This will initialize the printer exactly as if you had sent the Initialize Printer command straight to the printer, but in *much* less time. The same computer that took half an hour to initialize from WP 5.0 took about 5 minutes to create DOWNLOAD.LJ2. Once this file is created, you never need to repeat that step again, unless you change the set of fonts you initialize. The COPY command executes in under 3 minutes.

When you finish creating the DOWNLOAD.LJ2 file, be sure to change the port for this printer definition back to LPT1 (or the port you regularly use). Otherwise the

■ **FASTER FONTS:** Speed up downloading your laser printer fonts.

■ **QUOTABLE QUOTES:** You can dress up WP documents by changing standard typewriter-style quote marks into the typesetter variety.

■ **RECALL THE PREVIOUS FILTER:** Pressing F5 twice in *WordPerfect* lets you override the List Files default.

file DOWNLOAD.LJ2 will get overwritten the next time you use this printer definition.

We've set up several initialization files with different sets of fonts for various purposes (one for everyday use, one for newsletters, and so on), and put the COPY command into a short batch file that makes it easy to select the set we want. Now that we can initialize so quickly, we don't mind switching font sets, cancelling print jobs (without worrying about *WordPerfect* 5.0's warning that we'll have to reinitialize), or turning the printer off at the end of the day!

Jeff Giddings
Wareham, Massachusetts



Not everyone can expect to experience such a dramatic improvement in font downloading speed as did Mr. Giddings, but his horror story points to a genuine problem. The program I use to download some two dozen fonts into my own LaserJet II does the job in a couple of minutes, and has worked flawlessly with any number of different computers. Yet, for reasons unknown, with one particular Compaq model the program could take 20 minutes or more to initialize. With that machine, a straight DOS batch file using the COPY command speeded font down-

loading by the same factor of ten that Mr. Giddings discovered.

Word processors like *WordPerfect*, which provide the "convenience" of downloading fonts from within their own initialization routine, can run into the same problem. The special virtue of Mr. Giddings' solution is that by redirecting the entire contents of the Initialize Printer routine into a file, whichever additional codes WP adds to the fonts themselves get transferred, as well.

If you elect to make up several alternative DOWNLOAD files, you'll need a different printer definition for each one. You can use the Copy function in the Select Printer menu to create copies of your standard printer definition, and then edit these copies to select (mark with an asterisk) different sets of fonts from which you will create the matching initialization files for downloading the appropriate fonts.

QUOTABLE QUOTES

As a desktop publisher, I find that regular typewriter-style quotation marks (" ") do not look presentable; it's more professional to use the typeset-style open and close quotes (" "). But changing them all manually—especially in a long document—is tiresome. Instead, I use a *WordPerfect* 5.0 macro (shown in Figure 1), that searches for regular quotation marks and replaces them with the typeset variety.

The macro first determines whether there are any quotation marks; if not, it terminates. If the program finds an odd number of quotation marks, it informs you of this, tells you how many *complete* pairs were found, and then terminates without any conversion. It's up to you, of course, to find the odd one and correct the error.

If your document has an even number of quotation marks, the macro replaces the first in each pair with *WordPerfect*'s Character Map #4,32 (that is, character #32 from *WordPerfect*'s Character set #4) and the second with Character Map #4,31. Upon completion, the program informs you how many pairs of quotes were converted.

The Working Word



Figure 1: This WordPerfect macro changes typewriter-style quote marks into the typesetter's variety.

If your current printer font does not support these special quotation marks, WordPerfect will print them by sending graphics commands to the printer. However, if your printer does not support graphics commands, you'll have to use two left apostrophes (") for { ^V}4,32 and two right apostrophes (") for the { ^V}4,31.

Paul Alexander
Seattle, Washington



I generally hold that productivity is paramount. However, when printed appearance is important, it's certainly worth running a single macro—especially as it may keep you from having to import your document into a slow page-layout program. The line between "word processor" and "page-layout program" has gotten thin—sometimes at the expense of word processing speed—

but Mr. Alexander's approach gives you the best of both worlds.

RECALL THE PREVIOUS FILTER

One feature that I've sorely missed in WordPerfect is WordStar's Ctrl-R function, which recalls a previously selected choice. I was delighted to discover a similar—but undocumented—feature of the List Files (F5) function in Versions 5.0 and 5.1 of WordPerfect. Although the global filter is displayed on the bottom of the screen after the first F5 keypress, you can hit F5 again to recall the previously selected filter (such as *.LTR). Unfortunately, the technique doesn't seem to work with floppy disks.

Harvey J. Gardner
Huntington, New York



While this feature may be hard to find, WordPerfect did document it. True, the notice didn't make it into the 5.0 manual, but it is included in the README file for the updates. And since it is such a handy feature, I thought it should be mentioned here—just in case others miss it as well.

More often than not, I don't want the default directory listing that pressing F5, Enter inflicts on me. While I don't mind changing F:\WP51\DOC*. * to F:\WP51*. * I've often turned the air blue because the normal List procedure won't let me reaccess the directory listing I last called for. Thus this ability to "back up" is a blessing.

However, as nice as the feature is, it could cause some confusion. If you save a new file to disk and hit F5, F5, the new file will not appear on your directory list. Similarly, if you shell out to DOS and delete files, rename them, or copy them from another directory, F5, F5 will not reflect these changes. The reason: this key combination gives you an exact copy of the List Files screen you had before. Of course, if you perform any one of these functions within the List Files File Manager, you won't have a problem.

TIPS FROM WORKING WORDSMITHS

Tell fellow users about your latest word processing tips; we'll pay you \$50 for any tips we print. Please send your letter on a disk along with a printout. Mail your contributions to The Working Word, PC Magazine, One Park Avenue, New York, NY 10016, or upload them to PC MagNet (see the "By Modem" sidebar in the Utilities column).

by
Neil J. Rubenking

User-to-User

FORMATTING WITH DOS 4.0

Your discussion in User-to-User in the December 27, 1988, issue on DOS 3.3's /H format switch was really interesting. Did you know that DOS 4.0 also has a few hidden switches? The /H switch is gone but there are three others in its place. It didn't take long to figure out that these new parameters start FORMAT without any prompts, or which programs use the first two parameters to call FORMAT, but I'm still not sure of the significance of AUTOTEST.

The first parameter, /BACKUP, is the equivalent of the /H switch. When the format operation is complete, it will prompt for a volume label (if one was not supplied with the /V: parameter) and will also ask "Format another (Y/N)?". /SELECT, on the other hand, will also ask for a volume label (if one was not supplied) when the format operation is complete, but it will end without asking the question, "Format another (Y/N)?". If you use the /AUTOTEST switch, it will end without asking for a volume label or to "Format another (Y/N)?" when formatting is complete.

These parameters ought to give the batch file mavens enough flexibility for (almost) any situation. But there is something to be careful of: if you create an automated format batch file and use a replaceable parameter for the drive, you might format your fixed disk faster than you can say Control-Break.

Peter J. Persing
Mercer Island, Washington



DOS adventurers always discover these hidden switches at some point in their explorations. Microsoft might as well make them public so that everyone can benefit. The new parameters make it easy to write multidisk-formatting batch files, such as the example shown in Figure 1.

During formatting, DOS 4.0 reports what percentage of the job has been completed. This is more useful than the cryptic "Head: 1 Cylinder: 2" message found in

- **FORMATTING WITH DOS 4.0:** Undocumented switches can simplify your formatting chores.
- **SYSTEM SECURITY:** Lock up your computer so no one can use it when you're away from your desk.

DOS 3.3. All of the switches leave the status report intact.

If you format with no switches or with the /BACKUP switch, you'll get a display of disk statistics similar to the one in Figure 2. Note that the report includes the size of the disk's allocation unit (cluster) and the number of available units on the disk. It also displays the volume serial number, new with DOS 4.0. The /SELECT and /AUTOTEST options suppress this display.

SYSTEM SECURITY

I usually run SYSLOCK.COM before walking away from my PC. The program locks the system, disables Ctrl-Alt-Del, and prompts for a password. When you enter a password, a message appears, saying that it is accepted. If an invalid password is entered, SYSLOCK simply displays the prompt again.

The initial system password is xxxx. If you wish, you can change the password to suit your taste by modifying the code in SYSLOCK.SCR (Figure 3). Just change the following line:

```
DB "xxxx"
```

to reflect your preference. The password is case sensitive and can be up to ten characters. There should always be ten characters between the quotes, so if your password is shorter, make sure that you include the spaces.

The program is easy to create. Carefully type in SYSLOCK.SCR exactly as shown, using a pure-ASCII editor. Put a carriage

FORMAT4.BAT

COMPLETE LISTING

```
@ECHO OFF
ECHO FORMAT A: and B: continuously. ^Break to quit.
ECHO There had better be a disk in drive A: now!
:Loop
ECHO While A: is formatting, put a fresh disk in B:.
FORMAT A: /AUTOTEST
ECHO While B: is formatting, put a fresh disk in A:.
FORMAT B: /AUTOTEST
GOTO Loop
```



Figure 1: New switches in DOS 4.0 make it simple to create this multidisk-formatting batch file.

DISK STATISTICS DISPLAYED BY DOS 4.0'S FORMAT COMMAND

```
Format complete

Volume label (11 characters, ENTER for none)?

362496 bytes total disk space
362496 bytes available on disk

1024 bytes in each allocation unit
354 allocation units available on disk

Volume Serial Number is 1E1B-14E3
```



Figure 2: DOS 4.0's FORMAT program reports more information about the disk than previous versions.

User-to-User

return at the end of the script. At the system prompt, enter

```
DEBUG < SYSLOCK.SCR
```

If any Error messages appear, you'll have to fix the script and run it again.

Binh Tong

Lowell, Massachusetts



This is longer than our usual DEBUG script, but it's worth your time to enter. Be very sure you get all the bytes right—this little utility temporarily takes over interrupt 9, the keyboard interrupt. If you make a mistake in typing the listing, the resulting program may lock up your system more thoroughly than you had intended!

SYSLOCK's power comes from taking over the keyboard interrupt. All keyboard input goes to SYSLOCK, and it doesn't allow the Ctrl-Alt-Del key combination to reach the BIOS keyboard handler. The only way to unlock the computer is to type the correct password (unless, of course, you actually turn the computer off).

There's one possible problem, and that's the behavior of *SideKick*, one of the first RAM-resident utilities. Normally, the most recent program to trap an interrupt retains control of that interrupt. However, *SideKick* has a nasty little routine in it that retraps the keyboard interrupt if any other program grabs it. As a result, if *SideKick* is loaded, SYSLOCK can't prevent someone from rebooting your computer.

Borland provides a patch to prevent *SideKick*, Versions 1.56a and 1.52, from retrapping the keyboard interrupt. Get the file RETRAP.PAT from Borland's Application Forum on CompuServe (GO BOR-APP) and apply the simple patch it describes. Or make sure *SideKick* is not loaded when you lock your system with SYSLOCK.

SHARE YOUR SECRETS

Reveal your latest DOS and system discoveries through User-to-User; we'll pay you \$50 for any submissions we print. Please submit your letter on a disk together with a printout. Mail your contributions to User-to-User, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload them to PC MagNet (see the "By Modem" sidebar in the Utilities column). ■

SYSLOCK.SCR

COMPLETE LISTING

```
N SYSLOCK.COM
A 100
JMP 013D ;Jump to MAIN
DW 0
DW 0
STI ;**BEGIN** Interrupt Service Routine
PUSH AX
PUSH DS
IN AL,60 ;read key from keyboard port
CMP AL,00
JZ 0113
CMP AL,53 ;If it's not DEL, jump to OK
JNE 0136
MOV AX,0000
MOV DS,AX
MOV AL,[0417]
TEST AL,04 ;If Ctrl isn't pressed, jump to OK
JZ 0136
TEST AL,08 ;If Alt isn't pressed, jump to OK
JZ 0136
IN AL,61 ;Reset the keyboard, throw away the keystroke
MOV AH,AL
OR AL,00
OUT 61,AL
MOV AL,AH
OUT 61,AL
MOV AL,20
OUT 20,AL
POP DS
POP AX
IRET
POP DS ;OK -- let the normal INT 9 process the key
POP AX
CBI
JMP FAR [0102] ;**END** Interrupt Service Routine
MOV AX,3509 ;:MAIN
INT 21
MOV [0102],BX ;Save the original interrupt vector
MOV [0104],ES
MOV DX,0106
MOV AX,2509
INT 21 ;Install the Interrupt Service Routine
MOV AX,CS
MOV ES,AX
JMP 01AB ;Jump to MAINLOOP
NOP
DB D,A,"Please enter the system password : ",24
DB D,A,"Password accepted.",24
DB "XXXX"
DB " ",0,0,0
MOV AH,09 ;:MAINLOOP
MOV DX,0159
INT 21 ;Print the prompt
MOV CX,000A
MOV AH,07
MOV DI,019E
INT 21 ;:INPUTLOOP
CMP AL,0D ;If it's the ENTER key..
JZ 01C5 ;.. jump to CHECK
STOSB ;Jump back to INPUTLOOP
LOOP 01BA
JMP 01B2
MOV CX,000A ;:CHECK
MOV SI,0194 ;Compare the actual password..
MOV DI,019E ;.. with what was entered
REPE CMPSB
JZ 01DF ;If it matches, jump to FINISH
MOV AL,20 ;Otherwise, blank the input area..
MOV CX,000A
MOV DI,019E
STOSB
LOOP 01DA ;.. and jump back to MAINLOOP
JMP 01AB ;:FINISH
MOV AH,09
MOV DX,017F
INT 21 ;Print the "accepted" message
MOV DX,[0102]
MOV DS,[0104]
MOV AX,2509
INT 21 ;Restore the old INT 9
INT 20 ;All done

RCX
FS
W
Q
```

Figure 3: Protect your system with SYSLOCK.COM, which you can create with this DEBUG script.

by
Jeff Prosis

Tutor

A POSTSCRIPT PRIMER

What is PostScript? And what is it about PostScript printers that makes them so desirable and so expensive?

Michael Lubin
Orlando, Florida



PostScript is a programming language for printers. It's not a general-purpose programming language like C, BASIC, or Pascal, but a page description language (or PDL) that simplifies the task of transferring graphics to the printed page.

PostScript traces its origins to the late 1970s at the legendary computer graphics firm Evans & Sutherland. It moved from there to Xerox's Palo Alto Research Center in 1978, and underwent its final incarnation in 1982 when John Warnock and Chuck Geschke banded together to form Adobe Systems. The result was PostScript as we know it today—an interpreted language that makes it easy to put just about anything you want to on a printed page, be it text, vector graphics, or bitmapped images.

The allure of PostScript is that it makes generating complex images on printers a snap. It allows arbitrary shapes to be constructed from graphics primitives such as lines and curves. Once a shape, or *path* as it is known in PostScript, is built, it can be outlined, filled, or used to clip other graphics. In addition, PostScript makes it extremely easy to apply fonts to a page. Characters can be scaled, rotated, run along a path, or even used as clipping paths themselves.

As an example, think of how difficult it is for a program (or a printer driver) to draw a diagonal line from one corner of an 8½- by 11-inch page to another on a dumb laser printer (*dumb* is a term often applied to printers that do not incorporate PostScript or a similar page description language such as the HP LaserJet). The program first has to raster-convert the line to a virtual page stored in memory and then traverse the page from top to bottom, sending

■ A POSTSCRIPT PRIMER:
Generating complex
images on printers is
a snap, with this page
description language.

commands to the printer to fill in the line dot by dot. With PostScript, however, all it takes is this simple series of commands:

```
newpath
0 0 moveto
612 792 lineto
stroke
showpage
```

The `newpath` command tells PostScript to start a new path. `0 0 moveto` moves the pen to the lower-left corner of the page, and `612 792 lineto` draws a line to the

upper-right corner of the page (PostScript measures distances in points, where 1 point equals 1/72 of an inch). Finally, the `stroke` operator tells PostScript to apply ink to the line using the current color (or gray scale) and pen width, and the `showpage` command prints the page and ejects it from the printer.

Get the picture? PostScript shifts the burden of rasterizing graphics from a program or printer driver to itself. Many printers now have PostScript interpreters built in, so that all you have to do is send the PostScript commands out to your printer, and the printer takes care of the rest.

PostScript also takes the pain out of dealing with text. Most non-PostScript printers use bitmapped fonts exclusively, where characters are stored as arrays of dots. But bitmapped fonts aren't easily scaled; that's why you end up downloading three different fonts to a LaserJet when you want to print 8-, 10-, and 12-point

BOXES.PST

COMPLETE LISTING

```
% Define drawtext subroutine
/drawtext {
  /Times-Roman findfont          % Select font and print
  36 scalefont                   % a string centered on the
  setfont                         % page
  (Boxes by PostScript) stringwidth pop
  612 exch sub 2 div 200 moveto
  (Boxes by PostScript) show
} def

% Define drawbox subroutine
/drawbox {
  newpath
  0 0 moveto                      % Move to lower left corner
  100 0 lineto                   % Draw sides of box
  100 100 lineto
  0 100 lineto
  closepath
  setrgbcolor                     % Set color value
  fill                           % Fill the box
} def

% Main body of program

drawtext                          % Draw text
286 296 translate 0 .8 1 drawbox % Draw box
50 50 translate .4 .6 0 drawbox  % Draw box
50 50 translate .8 .2 0 drawbox  % Draw box
newpath
showpage                          % Print the page
```

Figure 1: Here is the PostScript language listing for BOXES.PST.

Times Roman on the same page.

PostScript stores characters as collections of lines and curves, so fonts are infinitely scalable. The code to print PostScript across a page in 72-point (1 inch) Times Roman characters may look like:

```
/Times-Roman findfont
72 scalefont
setfont
100 100 moveto
(PostScript) show
showpage
```

This program looks up the definition for Times Roman characters in a font dictionary (the table where PostScript stores font definitions) using `findfont`, scales it to 72 points with `scalefont`, and makes it the current font with `setfont`. The `show` operator prints the string in parentheses and `showpage` ejects the page.

It's that easy. It would have been equally easy to choose a Helvetica font or to have scaled it to 6 points instead. Most flavors of PostScript come with several different fonts, including Times Roman, Helvetica, and Courier, each in normal upright, bold, italic, and bold italic fonts.

The simple code fragments shown above only begin to tap into PostScript's power. Consider the short program shown in Figure 1. The `drawtext` procedure, de-



Boxes by PostScript

Figure 2: This raster image was created on an Apple LaserWriter by running the program `BOXES.PST` through the printer's built-in PostScript interpreter. Note the quality of the image and the relatively few lines of code (shown in Figure 1) required to produce it.

LOGO.PST

COMPLETE LISTING



```
/Times-BoldItalic findfont      % Select font
72 scalefont
setfont

(PC Magazine) stringwidth pop    % Find the center of the string
612 exch sub 2 div
400 translate

newpath
0 0 moveto
0 .5 1 setrgbcolor
(PC Magazine) show

newpath
0 0 moveto
1 0 0 setrgbcolor
(PC Magazine) true charpath clip % clip path

.25 setlinewidth
newpath
-15 1 90 {
  gsave
  rotate
  0 0 moveto
  500 0 lineto
  stroke
  grestore
} for

showpage                        % Print the page
```

Figure 3: This is the PostScript code listing for `LOGO.PST`. The output is shown in Figure 4.

fined at the top of the listing, prints "Boxes by PostScript" on the bottom half of the page. To center it uses PostScript's `stringwidth` to determine the width of the string and the built-in `sub` (subtract) and `div` (divide) operators to subtract the string width from the width of the page and divide the difference by 2.

The `drawbox` procedure draws a box 100 points on a side at the current pen position using the indicated color. Colors are set with the `setrgbcolor` operator by specifying values from 0 to 1 for red, green, and blue. This example also shows how PostScript programs pass parameters to procedures on the stack. The three RGB values passed to `drawbox` are placed on the stack when they're encountered following the `translate` operator and then popped back off when `setrgbcolor` is encountered in `drawbox`. So the instruction `0 .8 1 drawbox` draws a blue-green box at the current pen position.

The main body of the program, which starts near the bottom of the program text, uses the procedures defined earlier. Its output is shown in Figure 2. (The output shown in Figures 2 and 4 has been reduced for reasons of space.) Note that the boxes overlay one another. Because of this, we say that PostScript uses an opaque imaging model. It works as if you were applying layers to a page, with each layer masking out ones applied earlier.

The final program example, shown in Figure 3, uses PostScript's ability to use character outlines as clipping paths to produce an unusual *PC Magazine* logo. First, it calls up a 72-point italic bold Times Roman font, sets the red, green, and blue components of the current color to 0, 0.5, and 1, respectively, and writes "PC Magazine" in a rich blue. Then it changes the current color to pure red, redefines the outline of the string "PC Magazine" as the current clip path, and draws a series of radial lines at 1 degree increments emanating from the lower-left corner of the string. The result is shown in Figure 4. Notice the moiré effect in the *P* and the *C*, and the fine red lines streaking through *Magazine*.

There are several PostScript printers available for the PC, including the Apple LaserWriter, which can be used with IBM hardware, provided you can live with the slow serial data link. If you already own a laser printer, particularly an HP LaserJet, your options are many. Several companies offer PostScript boards that endow LaserJets with PostScript after the fact. A full review of hardware options appeared in the April 11, 1989, issue of *PC Magazine* ("Add-in Boards for the HP LaserJet").

You can also buy PostScript cartridges that plug into ports reserved for font cartridges. Or you can emulate PostScript in software, using products like *GoScript* or *GoScript Plus* from LaserGo, *UltraScript*

PC Magazine

PC or UltraScript PC Plus from QMS, or Freedom of Press from Custom Applications. Software emulation tends to be slow, but these products can cost as little as \$195—a small price to pay compared with the cost of a PostScript printer.

The bigger question is whether or not you want PostScript. It's a wonderful tool to have, especially if your work centers around desktop publishing. But PostScript is expensive, largely because Adobe licenses it to other vendors for hefty fees that are passed on to you the consumer.

Microsoft recently announced its plans for a competing language called TrueImage, which incorporates a PostScript-like font technology called TrueType. In addition, Microsoft has made it clear that Presentation Manager's Graphics Programming Interface, which bears many conceptual similarities to PostScript, will support non-PostScript laser printers. Add to this that many dumb laser printers, including HP's new LaserJet III, now come with PostScript-like scalable fonts built in,

Figure 4: PostScript allows graphics to be clipped to match the outline of a character string. Here, drawing operations were bounded to the inside of the characters in the string "PC Magazine" and a series of radial lines was drawn to fill in the image.

and it's anything but clear that investing in PostScript now will pay dividends later.

If you want to learn more about PostScript, there are several books on the subject. Among them: *PostScript Language Reference Manual* and the *PostScript Language Tutorial and Cookbook*, both written by Adobe Systems and published by Addison-Wesley. These are the definitive volumes on the language and offer a wealth of splendid programming examples illustrating exactly how PostScript works.

NEW ADDRESS

There was a small but fatal error in the DEBUG listing for NOPAUSE.COM, published

in the April 10, 1990, Tutor column. To account for an addressing discrepancy, add another 0 to the line DB 0,0,0,0. Sorry about the confusion.

ASK THE TUTOR

The Tutor explains techniques for using your hardware and software more productively. Questions about DOS and systems in general are answered. To have your questions answered, write to Tutor, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload them to PC MagNet (see the "By Modem" sidebar in the Utilities column). We're sorry, but we're unable to answer questions individually. ■

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by
Frank J. Derfler, Jr.

Connectivity

TWISTED-PAIR WIRING

A consultant provided our 50-person law firm with a design for a LAN in a new building. The PC users were shocked that he recommended using a star-type layout with unshielded twisted-pair wiring. I was under the impression that systems using unshielded twisted-pair do so as a sort of kludge to make use of existing telephone wiring. Given the choice, when you're starting fresh, doesn't it make more sense to use the best available coax or fiber-optic cabling? Can you point us in the right direction?

Ted Johnson
(via CompuServe)



A lot of folks have misconceptions about using unshielded twisted-pair wiring for Ethernet, ARCnet, or Token-Ring service. The first big error is thinking that you can use existing telephone wire. Chances are that you don't have enough wire pairs, the wires run through areas of high electrical noise, other services like intercoms won't let you use pairs in the same cable, or it's the wrong kind of wire. You're better off assuming that you'll have to pull new wire and then being pleasantly surprised if you find that you can use even a little of the existing stuff.

The best thing about unshielded twisted-pair wire isn't that it's cheap—the cost of labor overshadows the cost of wire—but that it's familiar and aesthetically acceptable.

Twisted-pair wiring for Ethernet conforms to an evolving IEEE standard called 10BaseT. This standard describes twisted-pair wiring with a 10-megabit-per-second data rate and baseband signaling. The benches at PC LAN Labs are groaning under the weight of 10BaseT wiring hubs, cables, and LAN adapters because we're in the middle of an evaluation of these products. On the whole, this is an excellent wiring alternative. It's resistant to outages and easy to install.

The twisted-pair wiring standard for

■ **TWISTED-PAIR WIRING:**
Sometimes it's a big mistake to use unshielded twisted-pair wires.

■ **MAKING MOBILE CONNECTIONS:** Cellular modems link laptops to the office.

■ **KEEPING UP TO DATE:**
What every technical library should include.

ARCnet was set by Standard Microsystems. From everything I hear, these installations work well. Both the ARCnet and Ethernet twisted-pair systems provide sound reliability.

Here's a joke currently making the rounds at trade shows. "What do you call a LAN administrator who uses unshielded twisted-pair wiring for Token-Ring?" The answer: unemployed. Unlike Ethernet and ARCnet, Token-Ring networks die totally if *any* of the four wires carrying data to any single station on the network develops a bad connection. A bad twisted-pair connection on ARCnet or Ethernet can lead to a station outage. If that station is a server or a gateway, of course, the problem is serious, but most outages are merely inconvenient. Every outage on an unshielded Token-Ring network is a disaster. I have seen some successful unshielded Token-Ring installations, but I've also heard some very sad stories.

I doubt that your law firm needs the extended distance features or resistance to electrical noise you'd gain from fiber optics, and I also doubt that you could justify the cost. If your consultant recommended twisted-pair wiring for Ethernet or ARCnet, I'd support it. If he recommended unshielded twisted-pair for Token-Ring, I'd find a new consultant.

MAKING MOBILE CONNECTIONS

We have people roaming the city in repair trucks all day. Right now they use cellular phones to call into the office for their instructions and then scribble the information on paper. Often they need to call back for a repeat. They use PCs in their trucks for troubleshooting. How can we connect the mobile PCs through cellular telephones to our internal database in order to eliminate voice calls and paper scribbling?

Hiram Roberts
Milwaukee, Wisconsin



Data transmission over cellular phone links presents many difficulties. Not only is line quality lower and more variable than even the worst land lines, but the modem must also contend with cell handoffs, which can cause it to lose the carrier for as long as 1 or 2 seconds.

I know of three companies—Microcom, Spectrum Cellular, and Telebit—that market products with cellular modem capabilities.

Microcom and Spectrum Cellular use special error-correcting protocols to survive the cellular interruptions. Microcom uses MNP-10, a superset of its well-known MNP protocol suite, to provide reliable high-speed throughput. With the Microcom solution, you'll need an MNP-capable modem (MNP-10 is best) at the fixed site location unless you have very quiet cellular communications locations. Microcom has some new cellular products that provide excellent capabilities. Call (800) 822-8224 to learn about them.

Spectrum Cellular modems use a proprietary error-correction system, SPCL, developed by Spectrum and licensed by a number of cellular modem manufacturers including ITC, Novatel, and Omnitel. Spectrum Cellular's LapPak combines a Toshiba T1200 laptop with a cellular phone and modem and costs from \$4,950 to \$7,025, depending on configuration. The company also has a full line of cellular modems starting at \$595.

Connectivity

A spectacular advantage of the Spectrum Cellular approach is that it has modems integrated into approximately 120 cellular systems around North America. This means you don't need a special modem at the fixed phone location. Call Spectrum Cellular at (214) 630-9825 for more information.

Telebit's cellular modem, the CellBlazer, has a blazing effective throughput rate of 16,800 bits per second. Telebit fights cellular interruptions with two technologies: modulation optimization and advanced proprietary error correction.

First, unlike standard modems, which use only one audio frequency for sending and one for receiving, the CellBlazer uses up to 511 different frequencies simultaneously across the entire usable cellular audio band of 30 to 3,000 MHz. Since it relies on only a few signal shifts per frequency, it's less sensitive to the quality of a single frequency. When it makes a connection, the modem automatically runs a "spectral analysis" to determine which frequencies are best; it can encode 2, 4, or 6 bits on good frequencies while transmitting only 2 bits or even skipping bad frequencies.

For error correction, the \$1,295 CellBlazer uses a proprietary CRC-16 based error-correction protocol (PEP, or packetized ensemble protocol) that does not involve the overhead of forward error correction. This supports the multichannel transmission method that the CellBlazer uses, varying the packet sizes per channel according to channel quality. If too many errors occur, it can shift to better channels or, as a last resort, it can kick back into training mode and reanalyze the quality of the line. Further, it can step down in increments of 100 bps, instead of halving its speed, as standard modems must. Note, however, that you need CellBlazers at both ends to make this link work.

CellBlazer supports Lempel-Zev compression, and this can be supplemented by software compression algorithms for throughputs of up to 30,000 bps. For communication over land lines, it supports V.22bis (2,400 baud) now. V.42 and V.42bis are in the works, V.32 is not.

Handoffs are detected automatically and handled through the standard error-correction routine; the modem knows not to hang up, remaining on the line and buff-

ering data until the handoff is completed and communication is restored. The sensitivity can be adjusted according to conditions. Communication with the host is always at 19,200 bps.

The company initially envisions highly specialized applications in field operations (insurance claims, field service, and so on) that may require transmission of large amounts of bit-image data. They demonstrated transmission of a digital image to us; it seemed to work well, though the poor cellular connections they were able to

**Spectrum Cellular has
modems integrated
into about 120 systems
around North America.**

make limited the modem's speed to about 6,000 or 7,000 bps. The modem got knocked off-line the first time it tried to make a connection, but it had the grace to do it in the initial connection phase, not in the middle of the job. The second try went smoothly.

The internal modem is a full-slot card, so your portable must be able to take standard IBM cards in order to really use it. You also need a data interface for your cellular transceiver, a klunky box with wires hanging out of it.

The cost, though high, is not exorbitant in relation to, say, 9,600 bps V.32 modems, and depending on how you pay for your cellular time, the CellBlazer may be a better deal than low-speed competitors. Contact Telebit at (415) 969-3800.

KEEPING UP TO DATE

I'm in charge of technical publications for a major network product developer. The variety of available newsletters is confusing. Which publications do you think our library should acquire?

Jane Slipo
Cleveland, Ohio



The first thing you need to acquire is a subscription to Ziff-Davis's *Computer Library* on CD-ROM. *Computer Library* is a database of 140 journals—30 in full text—and 11 top computer industry newsletters. A subscription

for a single CPU costs \$765 per year plus a charge of \$25 for shipping. If you want to make *Computer Library* available on a network, the LAN license costs an additional \$995 per year per concurrent access. This really isn't very expensive, when you consider that people don't usually enter the information base concurrently. The basic subscription and one LAN license would probably support a 50-user network. Call (212) 503-4400 for more information.

Computer Library is a great general resource, but unfortunately it doesn't contain the best LAN newsletter. Serious developers and manufacturers track the technology through the *LOCALNetter Newsletter*, marketed by Architecture Technology Corporation. This newsletter is only \$300 a year for subscriptions inside the U.S. It's always the first thing I fish out from the mass of my in-box. Call Architecture Technology at (612) 935-2035 to request a sample copy.

Finally, the LAN Labs just started work on a book with the working title "The *PC Magazine* Guide to Connectivity," to be published by Ziff-Davis Press. I suggest you save some of your budget for a few hundred copies.

CONNECTING TO AUTOMOTIVE COMPUTERS: PART II

In the May 15, 1990, issue of *PC Magazine*, we described the Diacom Diagnostic package designed to connect your PC to the computer diagnostics port of General Motors vehicles. We recently received a letter from Rinda Technologies informing us that they developed, manufacture, and market the product. The company we credited, Mextel, is a nonexclusive dealer.

Rinda just released a new \$299 software package that lets Diacom read data from 1984 through 1989 Chrysler vehicles. If you want your PC to know about your car's RPM, Hg, DEG, and VDC, contact Rinda Technologies at (312) 736-6633.

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Connectivity gives you practical solutions to networking problems of all types. We'll pay \$50 for any tips we print. Please submit your letter on a disk along with a print-out. Then mail your contributions to Connectivity, *PC Magazine*, One Park Avenue, New York, NY 10016, or you may contact Frank J. Derfler, Jr., via MCI Mail (be sure to use Derfler's box named PC MAGAZINE LAN LABS). We are unable to answer letters individually. ■

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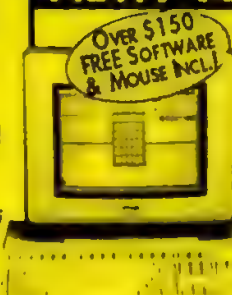
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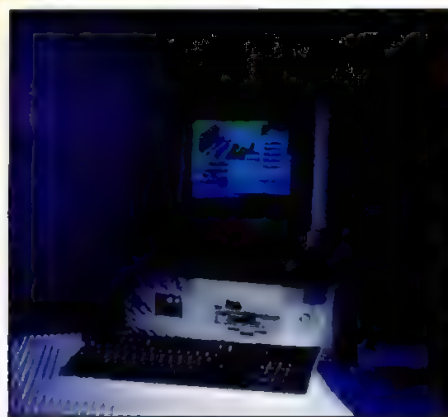
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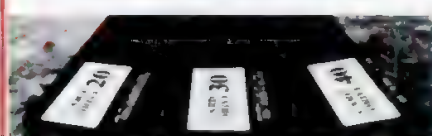
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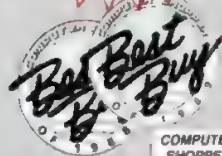
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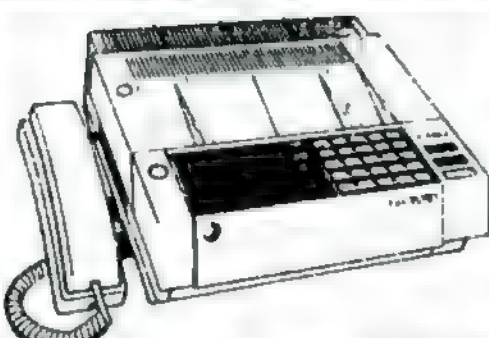
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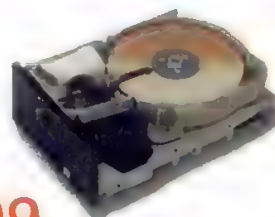
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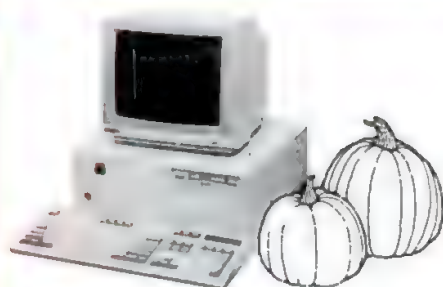
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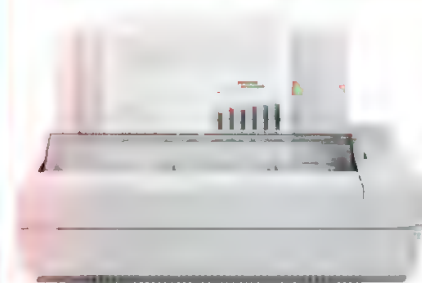


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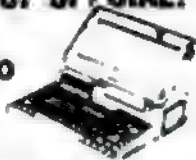
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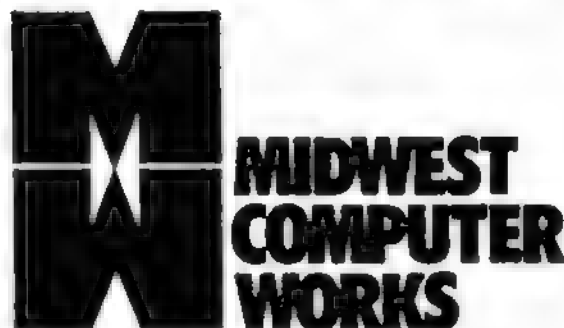
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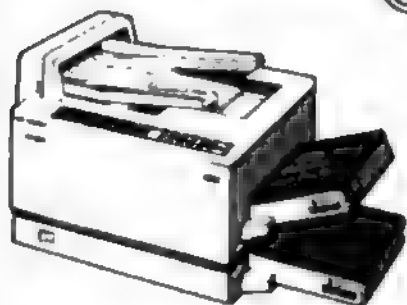
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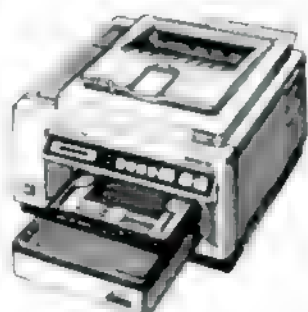
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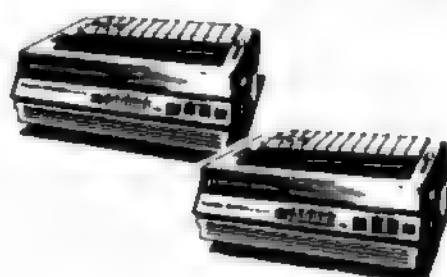
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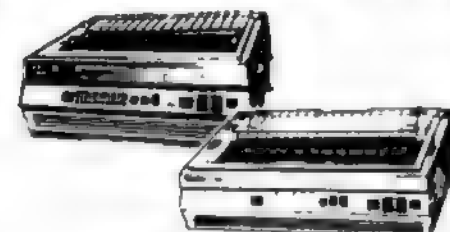
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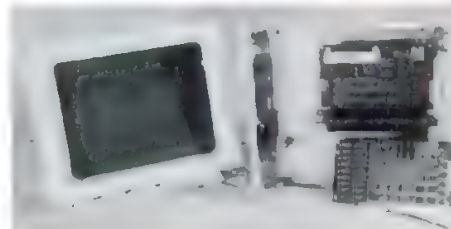


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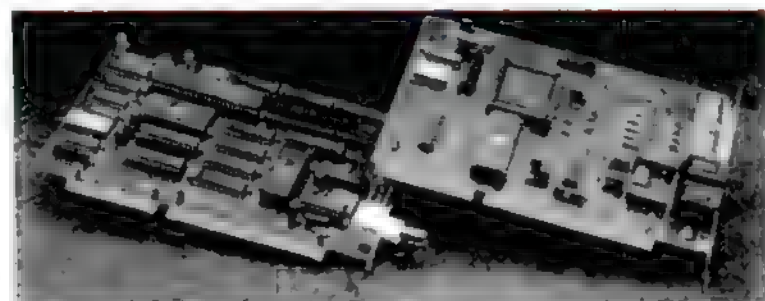
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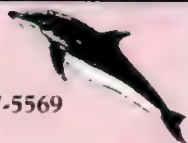
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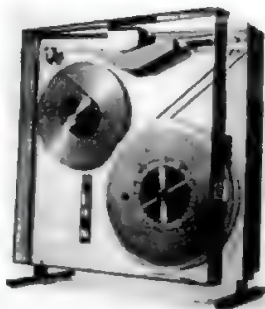
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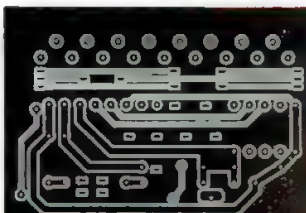
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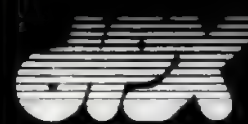
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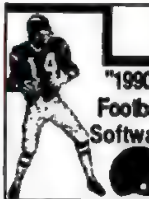
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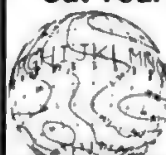
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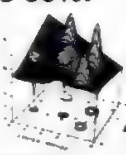
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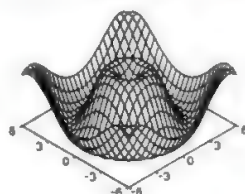
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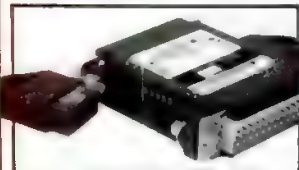
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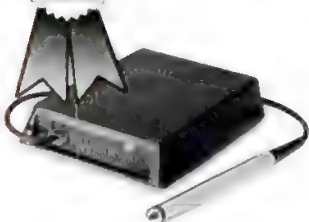


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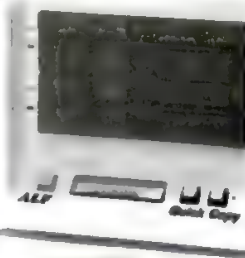
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CIRCLE 497 ON READER SERVICE CARD



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COMING UP

■ MULTITASKING ENVIRONMENTS

PC Labs evaluates software that can split your 386 chip into four or more virtual PCs and let you run different applications simultaneously. Packages evaluated include *DESQview 386*, *Microsoft Windows 3.0*, *Omniview*, *VM-386*, and *Vmos/3*.

■ TAPE BACKUP FOR HARD DISKS

PC Labs tests QIC drives from 25 vendors, including Colorado Memory Systems, Compaq, Core, Emerald, Everex, Irwin, and Tallgrass. All the products in this roundup can store at least 150MB.

■ SCSI: INTO THE NINETIES

PC Labs project leader Robert W. Kane examines the sudden interest in SCSI: why it's a "nonstandard" standard, where it's going, and whether IBM and Microsoft can make it the standard I/O device for PCs in the nineties.

■ 10BaseT

Thanks to 10BaseT adapter cards and wiring hubs, the best wiring for a LAN may be the phone wires already in the walls of your office. PC LAN Labs tests 11 10BaseT adapter cards and discovers a viable alternative to Ethernet, ARCnet coaxial cable, and the shielded twisted-pair wiring used in IBM's Token-Ring.

■ PORTABLES

Should you sacrifice the freedom of a lightweight notebook PC for the power of a 386SX? PC Labs tests the latest round of 286 notebooks, 386SXs, and a 386.

■ GRAY-SCALE EDITORS

Advanced desktop publishing programs and low-cost scanners have generated a demand for tools to help you integrate gray-scale images into your publications. Contributing editor Alfred Poor looks at six programs that let you achieve photographic effects with gray-scale images—a kind of digital darkroom. ■



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After Hours

Products for the Leisure Side of Personal Computing

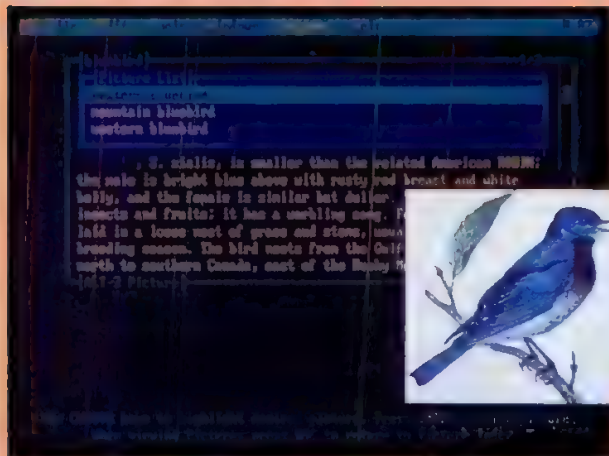
Electronic Encyclopedias Merge Text, High-Res Visuals, and Sound



From Aachen to Zyrien, with everything in between, three new CD-ROM-based encyclopedias offer a bookshelf's worth of information for students, educators, researchers, and the merely curious. *Grolier's Electronic Encyclopedia*, *World Book's Information Finder*, and *Com-*

clude more than 1,500 stunning color photographs displayable on computers with VGA monitors.

The *EE* relies on familiar pull-down menus (activated by Alt-key combinations) to set search parameters or call up help screens, file menus, and tool or edit windows. Text can be sent to a printer or disk file, and a notepad lets you jot down comments and notes.



Many of the articles in *Grolier's Electronic Encyclopedia* are complemented with beautiful full-color photographs.

ton's MultiMedia Encyclopedia are electronic versions of traditional multivolume reference sets. Not one article has been abbreviated or changed in the CD-ROM versions; only the method of delivery has been modernized to exploit state-of-the-art information-retrieval technology.

Grolier's pioneered the CD-ROM encyclopedia with the first edition of the *Electronic Encyclopedia* in 1986. The current version has been improved, updated, and expanded to in-

clude more than 1,500 stunning color photographs displayable on computers with VGA monitors. The *EE* relies on familiar pull-down menus (activated by Alt-key combinations) to set search parameters or call up help screens, file menus, and tool or edit windows. Text can be sent to a printer or disk file, and a notepad lets you jot down comments and notes.

Jefferson Airplane and Joseph Jefferson as well as to the president.

Many features and options may be accessed directly by using Alt-key combinations. Alt-I, for example, brings up an index of photographs so they may be selected and viewed individually as well as within a related article.

One of *EE*'s most powerful features is the Options menu (Alt-O), which sets search parameters (by article text, titles, picture captions, bibliographies, or fact boxes) and relationships of the search words (same article, same paragraph, words apart, or exact order). You might use these parameters to search for everyone born on the same birth date—a feat the other two products reviewed here can't duplicate.

World Book's Information Finder makes searching as simple as typing a topic. Typing "American Revolution," for instance, brings up 24 screens under the heading "Revolutionary War in America."

One outstanding feature of *Information Finder* is its split-screen interface. On the left, a

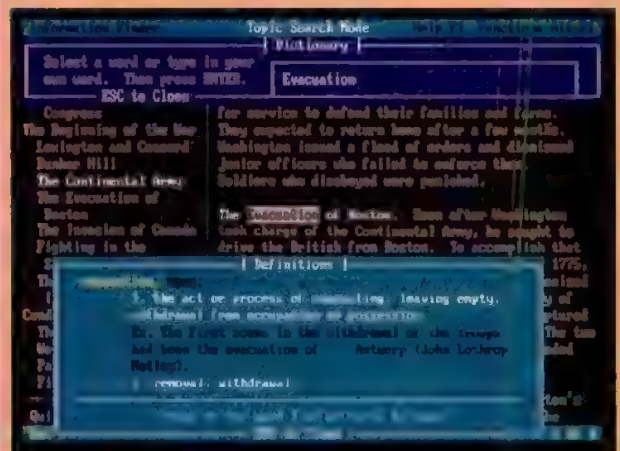


window displays a topic outline; on the right, a larger window contains the article. Moving the cursor through the outline causes the other window to page through the text. It's an intuitive, elegant, and easy way to view and organize a lot of information.

Additional information can be summoned by tapping function keys. F6 fetches a list of related articles, and F2 pops up a list of Quick Fact Tables. The F7 key gives you access to the 139,000-word *World Book Dictionary*, which is itself a handy reference.

Unlike the other two CD-ROM-based encyclopedias we evaluated, *Information Finder* lacks pictures and graphics. On

CONTINUES



In addition to encyclopedia articles, *World Book's Information Finder* has a built-in dictionary.

After Hours

CD-ROM

CONTINUED

the positive side, that means it will run with virtually any type of computer display. More distressing than the lack of visuals is *Information Finder's* limited print capabilities, which are no better than the print-screen function built into DOS. The program lets you print only one screenful of data at a time.

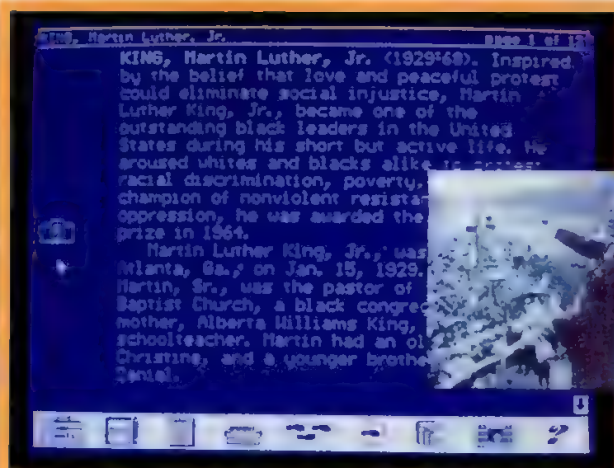
The publisher says printing was intentionally crippled because the product is aimed at schools; teachers want to discourage plagiarism. Perhaps the hollowness of that reasoning has become apparent—World Book says the next version will allow entire articles to be printed or saved to a disk file.

Compton's has gone all-out with its *MultiMedia Encyclopedia*. This cutting-edge product demonstrates what a CD-ROM can truly be. *MultiMedia* requires a mouse and a VGA display. A CD-ROM player with audio output jacks or a computer with IBM's speech adapter card is necessary for voice and music.

MultiMedia uses a point-and-click interface, and although everything can be reached by "clicking," most users will probably prefer to type out the name of their research topic. Once selected, the text appears in a scrolling window; icons along the left margin indicate the availability of additional material.

A camera icon means a photograph is available. Click on it and the screen fills with a high-resolution image. Other icons include an open book, which denotes a cross reference, and a pair of eyes, which symbolizes a summary. A set of headphones alerts you that speech or music is available, and a motion picture camera represents animation.

In an article on human anatomy, for example, clicking on the headphone icon next to text about the heart muscle triggers a recording of a heartbeat. Click on the camera icon beside the paragraph on joint movement and you'll see an animated sequence showing an elbow bend-



Compton's *MultiMedia Encyclopedia* has an excellent, mouse-based interface; icons are very effectively employed.

ing. Click on any word in the text, and *MultiMedia* will look up that word in its dictionary. If the word is underlined (as about 1,500 are), *MultiMedia* will pronounce it for you.

The main menu offers ways to access data other than through a topic search. There's an American history time line, a collection of articles on science, a picture explorer, an "idea search," and a topic tree, but my favorite is the world atlas. By clicking on a globe, you can zoom in on a specific country—or even a state and city—and then "click up" relevant articles.

The icon-based interface with the pictures, sound, and animation is sure to appeal to elementary, junior, and senior high school students; it could encourage them to explore topics more thoroughly than they might with traditional research materials. The high-tech interface is just the incentive that a slow learner or poorly motivated student needs.

MultiMedia is one very slick software package, and you'll want a fast computer (I recommend an 80386-based machine) to fully exploit all its features.

CD-ROM encyclopedias could be the first software products to stimulate broad consumer interest in

CD-ROM drives. The encyclopedias not only exploit the CD's massive storage capacity, but also can tap its high-quality audio capabilities. Given the sizable cost of most bookform encyclopedias, many home users may find the high-tech electronic versions to be surprisingly good values.

Each of these three CD-ROM reference works has its strengths; each has a place in the encyclopedia market. If I were picking a product for a school system, I would select *Compton's MultiMedia Encyclopedia*, simply because its high-tech interface would assure constant use by the video-game generation. For my own use as a research tool, I love the split-screen format of *Information Finder*. I'm not troubled by its lack of graphics, but I cannot tolerate its crippled print feature.

Until the next version of *Information Finder* comes out, I'd

pick *Grolier's Electronic Encyclopedia*. *Grolier's* is not only \$150 less expensive than *Information Finder*, but also has more bibliographic references than either of the other two encyclopedias. That's an important consideration for serious researchers.

List Price: *Grolier's Electronic Encyclopedia*, Version 2.0, \$395. Annual updates, \$125. **Requires:** 512K RAM; VGA required for graphics; CD-ROM drive with Microsoft CD-ROM Extensions, Version 2.1; DOS 3.0 or later. *Grolier Electronic Publishing*, Sherman Turnpike, Danbury, CT 06816; (800) 356-5590.

CIRCLE 401 ON READER SERVICE CARD

List Price: *World Book's Information Finder*, Version 2.0, \$579 (individuals); \$549 (schools). Annual updates, \$149. **Requires:** 640K RAM; CD-ROM drive with Microsoft CD-ROM extensions, Version 2.1; DOS 3.1 or later. *World Book*, Merchandise Mart Plaza, Chicago, IL 60654; (800) 323-6366.

CIRCLE 402 ON READER SERVICE CARD

List Price: *Compton's MultiMedia Encyclopedia*, Version 1.1, \$895 (individuals), \$795 (schools). Annual updates, \$195. **Requires:** 640K RAM; VGA adapter; CD-ROM drive with Microsoft CD-ROM Extensions, Version 2.1; mouse; Tandy sound chip or IBM speech adapter; DOS 3.3 or later. *Encyclopaedia Britannica Educational Corp.*, 345 Fourth St., San Francisco, CA 94107; (800) 554-9862.

CIRCLE 403 ON READER SERVICE CARD

CD-ROM ENCYCLOPEDIAS: SUMMARY OF FEATURES

	Grolier's Electronic Encyclopedia, Version 2.0	World Book's Information Finder, Version 2.0	Compton's MultiMedia Encyclopedia, Version 1.1
List price	\$395	\$579	\$895
Number of articles	33,000	17,000	31,200
Number of indexed entries	155,000	150,000	63,500
Number of dictionary entries	None	139,000	65,000
Number of graphs, tables, and fact boxes	1,200	1,700	500
Number of photos	1,500	None	10,000
Number of animation sequences	None	None	45
Minutes of speech or music	None	None	60

After Hours

Harmony Offers Arcade Action with No Violence

GAMES
by Neil Rubenking

Accolade's *The Game of Harmony* is a refreshing departure from the usual arcade fare. Instead of blowing up tanks, zapping aliens, or kick-boxing ninja assassins, you do your best to ease tension and prevent blow-ups. Careful strategy and a cool head are definitely prerequisites for success.

In the world of *Harmony*, colored spheres float across a pastel background. One sphere, "the Seeker," is under your control. You rotate and accelerate it in order to bump like-colored spheres into each other. When they meet, they "synergize" into nirvana and disappear with a musical farewell. Merge all the spheres and you've finished one of the 50 levels. Some of *Harmony*'s screens have obstacles that the spheres rebound from, while at other levels spheres are connected by "springs" that resist both tension and compression.

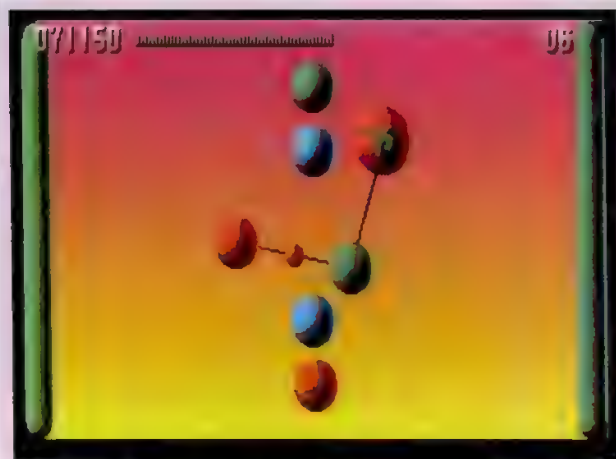
If two spheres of different colors collide, they produce one or more "pods" of a third color. Eat those pods quickly, Pac-Man style, or they'll expand into more spheres. Take your time, set up your shots like a pool shark, stay cool under pressure—but don't take too long, or the spheres will explode with tension and drain your energy. For real relaxation, choose "Mantra Mode" to turn off the explosions.

Strategy, not arcade skill, is the key to winning at *Harmony*. For each screen there's a strategic solution that exploits characteristics of the *Harmony* environment. For example, one level contains eight spheres connected in pairs by springs. It's almost impossible to clear this level by shoving like-colored spheres toward each other, because that takes too long. But push one sphere off the edge of the screen and the spring will snap it right into the matching sphere. Other screens omit one of the spheres

needed for synergy; you have to create it by knocking differently colored spheres together.

Harmony takes advantage of high-tech computer systems without leaving behind the older models. CGA systems use 4 colors, while EGA and Tandy systems use 16. VGA and MCGA users get 3-D shading effects and attractive colors. If the system has a supported sound board, *Harmony* uses it to generate music and sound effects.

The game uses an off-disk copy-protection scheme that requires you to match a screenful of spheres and pods with one of two dozen examples. Alas, the tiny example screens are printed on ugly brown-on-maroon paper that can't be photocopied, and they're just over an inch high.



Accolade's *Harmony* replaces the usual arcade mayhem with a beautifully abstract world of subtly colored spheres.

Harmony demands a combination of strategy and skill, like the popular *Tetris*. And it's equally addictive; I've played to level 50 several times, with inordinate satisfaction. Two can play, working together in a "Harmonic Convergence." Buy this game on a Friday so that you'll have all weekend to play!

List Price: *The Game Of Harmony*, \$44.95. **Requires:** 512K RAM; CGA, EGA, VGA, MCGA, or Tandy graphics adapter; DOS 2.1 or later. Copy protected through documentation. Accolade, 550 S. Winchester, #200, San Jose, CA 95128; (408) 985-1700.

CIRCLE 406 ON READER SERVICE CARD

Ecology Simulation Encourages Gamers To Put Earth First

GAMES
by Alan Cowen

Chris Crawford has long been hailed as "the game designer's game designer." It's a well-deserved title, but Crawford's simulations are more like complex environments than mere games. Like all environments, they can be manipulated, they can prosper, and if they are abused, they can self-destruct—game over, no bonus points.

Crawford's latest environment is, quite literally, the environment. True to form, he pulls no punches with *Balance of the Planet*; Earth is in pretty sad shape, and it's only going to get worse.

You've just been appointed the United Nations High Commissioner of the Environment, and it's far from an enviable job. Using your powers to tax industry and grant subsidies, you directly and indirectly control the

quality of life on Earth. Your actions profoundly affect energy resources, food production, industrial output, and birthrate, not to mention Mother Nature. There are hundreds of variables involved, in a giant ecological chain reaction.

Each variable influences many other variables. If you ignore a link, you watch the chain reaction run wild. In other words, your score gets sucked right through that big old hole in the ozone layer.

The entire game revolves around this principle of cause and effect. To solve a problem, you must be aware not only of why the problem exists, but also of the ramifications of any potential solution. Take fossil fuels. When you burn coal in power plants, toxic emissions mix with water vapor in the air and return to earth in the form of acid rain. Acid rain kills fish and poisons our lakes. It also destroys forests

and damages property.

So what can you do to eliminate acid rain? You could levy a hefty tax on coal and oil and use these revenues to subsidize nuclear power, which is relatively clean and abundant. Since you no longer need to burn coal, harmful emissions decrease, acid rain is controlled, and everything is just fine with the environment. Right?

Not quite. Increase dependence on nuclear power and you'll increase your inventory of nuclear waste, not to mention the probability (however slight) of a catastrophic Chernobyl-style accident. And breeder reactors produce weapons-grade plutonium. You don't want that stuff just lying around.

Balance of the Planet gets even more complicated than that. Raise the tax on oil and you'll discourage oil use. Decreased oil use means decreased industrial output, which leads to decreased output of consumer goods and a smaller supply of available housing. The quality of life drops, and you've pretty much failed miserably. Oh, well.

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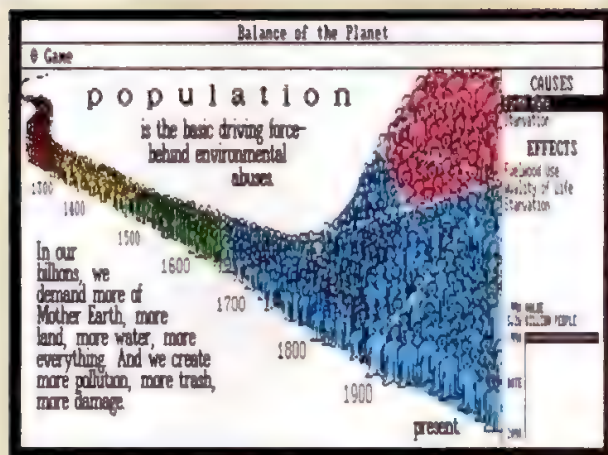
After Hours

Planet

CONTINUED

So what about solar power, you ask? Solar, too, is clean, abundant energy—without the hassles of waste or radiation. But even here there are side-effects to consider. Increased use of solar power means more people will be killed in falls while cleaning their rooftop collectors. It sounds ludicrous, but it happens, and you've got to take it into account.

Each environmental variable in *Balance of the Planet* is represented by its own full-screen graphical display. While none of the visuals can be called state of the art, many are appealingly and creatively rendered with childlike, "cookie-cutter" style graphics. Other screens are cruder and displayed in monochrome. Each screen is accom-



In *Balance of the Planet*, environmental variables like population growth are represented by simple graphics.

panied by relevant charts and statistics, as well as a listing of cause-and-effect variables.

Points are awarded for environmentally beneficial results, such as a lessening of the global starvation rate. Similarly, points are deducted for environmentally

detrimental policies. Let the ozone layer wither away and ultraviolet rays will seep in through the atmosphere. People will die of skin cancers and you'll lose points.

Suffice it to say that *Balance of the Planet* can be one frustrat-

ing game to play. It offers no easy choices, and every decision is a compromise. Crawford seems to relish the dilemmas he creates, and he steadfastly refuses to sugarcoat the Earth's environmental predicament. He tells it as it is—take it or leave it.

There's no attempt whatsoever to jazz up the playability with fancy features or animation. Indeed, there isn't even any sound. *Arkanoïd* this game's not.

Balance of the Planet is by no means for everyone. In fact, it's probably best suited only for diehard Chris Crawford fans. But if you're willing to accept a gritty, real-world challenge, you'll find it a rewarding, enlightening experience.

List Price: *Balance of the Planet*, \$49.95. **Requires:** 512K RAM; hard disk; CGA, EGA, or VGA graphics; DOS 2.0 or later. Accolade, 550 S. Winchester Blvd., San Jose, CA 95128; (800) 245-7744.

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by
Bill Howard

Abort, Retry, Fail?

The Lighter Side of Personal Computing

Small, yes. Stylish, perhaps. But a built-in monitor? No way. (From a *PC Week* article on diskless workstations, April 16, 1990.)



Emerald Computers' very small and stylish LAN-station 1 has a built-in monochrome EGA display.

At 3,600 Revolutions per Second, They Probably Would Sound Like Jet Engines

"Hard disk drives are another source of noise. The platters, which spin at 3,600 revolutions per second, can sound like jet engines." Lawrence Magid column, *Los Angeles Times*, May 3, 1990

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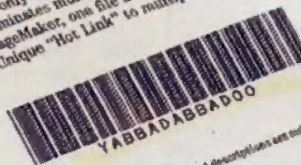


And zero hesitation, er, wait states: Ad for Epson Apex 200/40 PC by Work Place, a Florida office equipment company, in *The Tampa Tribune*.

Print/Plan	<F12>
Print/Batch print	<alt+B>
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Edit/Swap spouse	<F5>
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Tools	<alt+T>
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Tools/Adding machine	<alt+A>

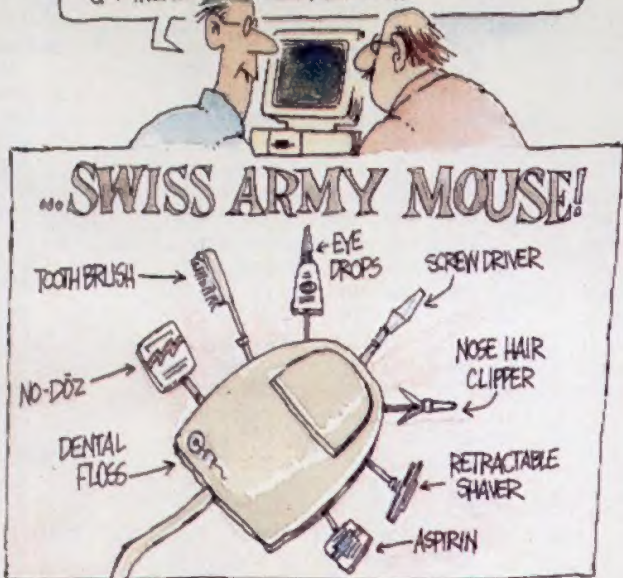
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AMAZING FACTS

Ashton-Tate Corp., Torrance, Calif., said it posted a first-quarter loss of \$1 million, or four cents a share, as revenue plummeted 37% to \$57 million. The company cited continuing slumping sales resulting from delays in the introduction of its upgraded version of BASE IV, a computer spreadsheet program. *The Wall Street Journal*, April 20, 1990

If your entry is used in *Abort, Retry, Fail?* we'll send you \$50 and a *PC Magazine* T-shirt. Caution: In case of multiple entries, the postmark date, neatness and completeness of entry are considered. Winners this issue: James L. Ransford (dBASE IV Spreadsheet), Paul T. Snapp (jet engine), David S. Reinhart (Yabbadabbadoo), Lloyd A. Lindsay (Edit/Swap spouse), Vern Garvelink (built-in display), Michael W. Newton (12.78 MHz).

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